THE EFFECTS OF EDUCATIONAL QUALITY ON THE COGNITIVE PERFORMANCE OF MINORITY AND CAUCASIAN HIV$^+$ SUBJECTS

by

REON ALDRÉE ELENY BAIRD

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2007

UMI Number: 3283618

Copyright 2007 by
Baird, Reon Aldree Eleny

All rights reserved.

UMI

UMI Microform 3283618
Copyright 2008 by ProQuest Information and Learning Company.
All rights reserved. This microform edition is protected against
unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

© 2007

REON ALDRÉE ELENY BAIRD

All Rights Reserved

This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

__________________ ________________________________

Date **Joan C. Borod, Ph.D.**
Chair of Examining Committee

__________________ ________________________________

Date **Joseph Glick, Ph.D.**
Executive Officer

Sarit Golub, Ph.D.

Desiree Byrd, Ph.D.

Elizabeth Ryan, Ph.D.

Laura Rabin, Ph.D.

Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

Abstract

The Effects of Educational Quality on the Cognitive Performance of Minority and Caucasian HIV^+ Subjects

by

Reon Baird

Advisor: Joan C. Borod, Ph.D.

When matched on years of education, ethnic minorities have been found to have poorer neuropsychological (NP) performance, relative to Caucasians, and lower levels of literacy. This disparity between years of education and literacy in racial groups has been suggested to be due to quality of education (QEd), which is not synonymous with quantity of education (Manly, 1998). This study examined the extent to which QEd influenced performance on NP measures of cognition after accounting for number of years of education and reading level. Previous literature has examined QEd in a single form (i.e., reading level). The current study developed the Baird Quality of Education Scale, a 30-60 minute, comprehensive, self-report questionnaire, comprised of factors associated with QEd, to examine the impact of QEd on NP performance. Retrospective NP data and responses to the questionnaire were collected and used in the analyses.

Data were collected from HIV^+ participants (n = 50), with a wide range of ages (34-62), education levels (9-18), QEd scores (50-167), and WRAT-3 reading T-scores

(20-62). Participants were recruited from the Mount Sinai Medical Center. Neuropsychological data, normed for age and gender, were collected from seven cognitive domains sensitive to functioning in HIV: motor, speed of information processing, attention/working memory, learning, memory, verbal fluency, and executive functioning.

Results from stepwise regression analyses showed that reading level accounted for greater variance than did education level and QEd in attention/working memory, learning, memory, verbal fluency, and executive functioning. There were no significant age, gender, or ethnicity differences in QEd performance. Caucasian participants showed a significantly higher number of years of education than Hispanics and a significantly higher reading level than both Hispanic and African-American participants. In sum, the QEd scale did not account for variance in neuropsychological testing. These findings suggest that reading level continues to be important in the assessment of cognitive functioning in HIV.

Acknowledgments

This project was made possible by a grant from the National Institute of Mental Health No. PA-01-079, which could not have been obtained without the aid of Drs. Elizabeth Ryan, Susan Morgello, and Desiree Byrd of the Manhattan HIV Brain Bank at Mount Sinai School of Medicine. Dr. Ryan was instrumental at the onset of my HIV-related research activities. She offered me my first opportunity within the field of HIV research. I appreciate the time, effort, and counsel she has provided. I thank her, Dr. Morgello, and Dr. Byrd for their continued guidance, encouragement, and support.

I am also grateful to my supervising committee members who helped bring this project to its completion, especially Dr. Sarit Golub who helped me expand my creative thought processes. The unique perspectives of each of my committee members added to the depth and originality of this research. I am also very much appreciate the time and energy that Drs. Laura Rabin and Elizabeth Ryan devoted as readers of this project. The support I received from my committee chair, Joan Borod, Ph.D., goes far beyond the scope of this project. Joan has supported me since I began graduate school in her lab. Her generosity, guidance, and advice throughout the years mean more than I could ever attempt to express in words. A simple but heartfelt thanks to you, Joan.

Last, but certainly not least, the Creator has blessed me with an insurmountable family and group of friends who span the globe from Guyana to London to India and the United States. Instead of identifying each person's contributions, I would like to collectively thank my friends for their unconditional emotional support and encouragement. To my family, thank you for supporting me in every way during these years. I appreciate your contributions to my career goals and love you all very much.

Table of Contents

Abstract ---------- iv

Acknowledgements ---------- vi

List of Tables ---------- x

Introduction ---------- 1

Factors Underlying Ethnic/Racial Differences ---------- 4

Current Study ---------- 11

Review of the Literature ---------- 13

Ethnic Group Differences in HIV ---------- 13

Epidemiology and Demographics of HIV in the United States ---------- 14

Neuropathology of HIV/AIDS ---------- 16

Risk Groups and Transmission ---------- 19

Neuropsychological Effects of HIV ---------- 22

Neuropsychiatric and Psychosocial Effects of HIV ---------- 25

Functional Effects of Cognitive Impairment in HIV ---------- 29

Methods to Address Ethnic/Racial Disparities in Neuropsychological Performance ---------- 30

Quality of Education ---------- 34

Motivation for Achievement ---------- 40

Purpose and Significance of the Current Study ---------- 44

Hypotheses ---------- 47

Method ---------- 51

Research Design ---------- 51

Participants -- 51

Procedures-- 53

Instruments--53

Neuropsychological Battery --53

Quality of Education Scale ---60

Proposed Experimental Procedure--68

Piloting--69

Data Analyses--73

Results -- 78

Statistical Analyses -- 78

Total Sample Characteristics -- 78

Hypothesis 1: QEd as a Predictor of Neuropsychological Performance ---------- 93

Hypothesis 2: QEd and Ethnic Groups -- 94

Hypothesis 3: Relationship between QEd, WRAT-3, and Years of Education -- 94

Hypothesis 4: QEd and Motivation for Achievement ------------------------------ 95

Hypothesis 5: High School Transcript and Self-Reported Academic ----------------

Performance -- 97

Hypothesis 6: QEd and High School Transcript GPA -----------------------------100

Hypothesis 7: Parent/Guardian Education & Involvement ----------------------- 101

Hypothesis 8: Attendance & Performance and Neuropsychological

Performance-- 101

Hypothesis 9: High School Employment and GPA --------------------------------102

Discussion ---104

QEd -- 104

QEd and Motivation for Achievement -- 106

Generalizability of the Results --- 107

Strengths of the Current Study --- 108

Limitations of the Current Study ---110

Future Directions --112

APPENDIX A: AIDS Defining Illness--- 114

APPENDIX B: Abbreviated Terms -- 115

APPENDIX C: Questionnaire Screening Criteria -- 116

APPENDIX D: Baird Quality of Education Scale ---117

References-- 129

List of Tables

Table 1: Cognitive domains and neuropsychological measures --------------------------- 54

Table 2: Pilot Demographics - Phase 1 --- 69

Table 3: Pilot Demographics - Phase 2 --- 70

Table 4: Cronbach's alpha coefficients --- 72

Table 5: Age, gender, education level, reading level, and Motivation for Achievement data by ethnic group -- 79

Table 6: Cognitive domain performance by ethnic group --------------------------------- 80

Table 7: Reading level, years of education, and Motivation for Achievement by ------ gender --- 81

Table 8: Cognitive domain performance by gender --------------------------------------- 81

Table 9: Age, gender, ethnicity, education level, reading level and quality of education by recruitment group -- 82

Table 10: Education level, reading level and Motivation for Achievement data by recruitment group --- 82

Table 11: Cognitive performance by recruitment group ------------------------------------ 83

Table 12: Correlation between age and reading level, years of education and Motivation for Achievement --- 84

Table 13: Correlation between age and cognition -- 84

Table 14: Descriptive statistics and Cronbach's alpha reliability estimates ------------- 85

Table 15: Questions 17, 18, 19 and 20 from the Student/Teacher Ratio subscale ------- 86

Table 16: Correlation matrix for the items in the Student/Teacher Ratio subscale ------ 86

Table 17: Questions 39, 41, 42, 43 and 45 from the Attendance & Performance

Subscale ----- -- 87

Table 18: Correlation matrix for items in the Attendance & Performance subscale ----- 88

Table 19: Descriptive statistics and Cronbach's alpha reliability estimates for the revised QEd scale -- 88

Table 20: Descriptive statistics for the total QEd scale ------------------------------------- 89

Table 21: QEd data by ethnicity, gender and recruitment group -------------------------- 89

Table 22: QEd subscales by ethnicity -- 90

Table 23: QEd subscales by gender -- 91

Table 24: QEd subscales by recruitment group --- 91

Table 25: Pearson's correlations for Total QEd and individual subscales --------------- 92

Table 26: QEd scores by ethnic group --- 94

Table 27: Pearson's correlation for Reading level, QEd, and number of years of Education -- 95

Table 28: Descriptive statistics for Motivation for Achievement -------------------------- 95

Table 29: Linear regression results from the prediction of Motivation for Achievement -- 96

Table 30: Descriptive information for participants with returned high school transcripts -- 97

Table 31: Transcript GPA by ethnic group --- 98

Table 32: Transcript GPA by gender --- 98

Table 33: Self-reported GPA by ethnic group -- 98

Table 34: Self-reported GPA by gender -- 99

Table 35: Transcript and self-reported GPA --- 99

Table 36: Correlation between self-reported and transcript GPA -------------------------- 99

Table 37: Descriptive data for median split on transcript and self-reported GPA data - 100

Table 38: Descriptive data for median split data on transcript and QEd data ------------100

Table 39: Correlation between Parent/Guardian Education & Involvement and cognitive domains ---101

Table 40: Summary of linear regression analysis for the prediction of performance on learning from the Attendance & Performance subscale --------------------------- 102

Table 41: Summary of linear regression analysis for the prediction of performance on attention/working memory from the Attendance & Performance subscale ----- 102

Table 42: GPA results for employed and unemployed participants ----------------------- 103

Table 43: Pearson's correlation of Motivation for Achievement and QEd subscales -- 107

Table 44: Correlations between recall accuracy and neuropsychological tests --------- 110

Introduction

The United States population is steadily increasing with regard to population size and diversity within and across racial and cultural groups. With an ever growing and increasingly diverse population, the need to understand the differences between racial and ethnic performance on cognitive tests to ensure accuracy in the diagnosis of disease-related cognitive impairment is essential.

Within the neuropsychological literature, consistent differences have been reported between healthy ethnic/racial minorities and their Caucasian counterparts on numerous neuropsychological tests (Jacobs et al., 1997; Kaufman, Mclean, & Reynolds, 1988; Manly et al., 1998a; Manly et al., 1998b; Welsh et al., 1995). These differences in cognitive performance have been reported to be as great as one standard deviation (DeShon, Smith, Chan & Schmitt, 1998; Evans, Miller, Byrd, & Heaton, 2000; Heaton, Taylor, & Manly, 2001; Manly et al., 1998a). African-American and Hispanic minorities, for example, have been shown to perform 0.5 to 1.0 standard deviation below Caucasians on neuropsychological tests assessing visual and verbal learning and memory, verbal fluency, visuospatial skills, and abstract reasoning (DeShon, Smith, Chan & Schmitt, 1998; Lopez & Taussig, 1991; Manly et al., 1998a; Manly et al., 1998b; Manly, Jacobs, Touradji, Small, & Stern 2002; Reynolds, Chastain, Kaufman & McLean, 1987).

Roberts and Hamsher (1984) were among several researchers who reported on the disparities in performance between African-American and Caucasian participants on neuropsychological measures. Results from this study revealed a substantial difference in performance between neurologically normal African-American and Caucasian participants, with African-Americans scoring lower than Caucasians on a visual naming

task (Roberts & Hamsher, 1984). According to Roberts & Hamsher (1984), utilizing the standard cutoff scores for cognitive impairment, 22% of the normal, healthy, African-American participants would have met the criterion for neuropsychological impairment. This finding presents a major problem in using the standard cutoffs to diagnose neuropsychological impairment in neuropsychologically healthy minority individuals. Similarly, in a later publication, Manly et al. (1998b) reported significantly lower scores for non-demented African-American participants versus Caucasians on tests of language, verbal and nonverbal learning and memory, abstract reasoning, and visuospatial skills, even after groups were matched on number of years of education ($F[15, 409] = 11.49$, $p < 0.000$). Differences in performance on neuropsychological measures between African-Americans and Caucasians have also been reported on tests of naming (Boston Naming Test) and reaction time with African-Americans consistently performing below their Caucasian counterparts (Kaplan, Goodglass, & Weintraub, 1983; Miller, Bing, Selnes, Wesch, & Becker, 1993).

The disparities in neuropsychological test performance between ethnic groups have also been reported in studies with healthy normal Hispanic samples. La Rue, Romero, Ortiz, Liang, & Lindeman (1999), for example, administered a neuropsychological battery spanning the domains of attention (WAIS-R Digits Forward), learning and memory (Fuld Object Memory Evaluation), verbal fluency (Same Sex First Name subsection of the Fuld Object Memory Evaluation), visuoconstruction (Clock Drawing), psychomotor speed, and cognitive flexibility (Color Trail Making Test) in a sample of 797 healthy Hispanic and Caucasian elders (mean sample age = 73.6; mean education, Caucasians = 13.8 years, Hispanics = 9.5). Study findings revealed a

significant effect of ethnicity across all cognitive domains, with Hispanics scoring lower than Caucasian participants. Mean differences between Hispanic and Caucasian groups were .78 SD for attention, .42 SD for psychomotor speed and cognitive flexibility, .28 SD for learning and memory, .25 SD for visuo-construction, and .20 SD for verbal fluency. Findings from this study are consistent with literature that illustrates significant differences in neuropsychological test performance between healthy Hispanic and Caucasian participants, with scores favoring older and more educated Caucasians (Jacobs, Sano, Albert, Schofield, Dooneief et al., 1997; Lopez & Taussig, 1991; Lowenstein, Arguelles, Arguelles, & Linn-Fuentas, 1994; Taussig, Henderson & Mack, 1992). The ethnic/racial group differences in the La Rue et al. (1999) study were influenced by both number of years of education and ethnicity, such that the more educated Caucasian participant scored greater in neuropsychological performance. The lower scores for Hispanic participants in this study may have been influenced by decreased educational opportunity/access. This suggests a need to examine methods of adequately assessing the educational experiences of those with little formal schooling versus those with more years of formal education.

Although several studies examining the neuropsychological test performance of minorities and non-minority participants have demonstrated ethnic/racial disparities in test scores, conversely, some equivalence in performance between ethnic/racial groups has also has been reported in the literature when groups were matched on years of education (Loewenstein, Arguelles, Barker, & Duara, 1993; Loewenstein, Duara, Arguelles, & Arguelles, 1995; Marcopulos, McLain, & Giuliano, 1997; Taussig, Henderson, & Mack, 1992). However, the vast majority of studies report mean

performance differences between neuropsychologically normal ethnic/racial minorities and Caucasian participants, with scores favoring Caucasians. It is this abundance of reported ethnic/racial group disparities in neuropsychological test performance that is of interest to the present study.

Factors Underlying Ethnic/Racial Differences

The differences reported between normal, healthy ethnic minorities and Caucasians in neuropsychological test performance may suggest lower cognitive ability in ethnic minorities, or a higher prevalence of neuropsychological disorders within this group. Drawing this conclusion can be risky if one does not consider the underlying factors that impact cognitive performance in an ethnic minority population, such as lower socioeconomic status, education, and lack of ethnic representation within the normative data samples used in the interpretation of neuropsychological test scores and neurocognitive diagnoses.

Whereas neuropsychological measures are used to assess and detect cognitive functioning, results are often confounded by demographic and sociocultural factors, including gender, age, education, and socioeconomic status (Adams, Boake, & Crain, 1982; Heaton, Ryan, Grant & Matthews, 1996; Ryan et al., 2005). In actuality, several neuropsychological measures require some normative data correction (e.g., correction for age, gender) to one or more demographic factors to achieve greater accuracy in interpretation and diagnosis (Gladsjo et al., 1999; Heaton, Ryan, Grant & Matthews, 1996; Kaufman, McLean, & Reynolds, 1988; Lichtenberg, Ross, & Christensen, 1994). The following sections review some factors hypothesized to influence interpretation of

neuropsychological test performance among ethnic/racial groups including socioeconomic status, normative data samples, acculturation, and education.

Socioeconomic Status (SES). The vast majority of studies investigating factors that impact neuropsychological test performance in adults have focused on age, gender, and education. However, SES also exerts a significant effect on performance (O'Bryant, O'Jile, & McCaffrey, 2004). Higher SES, operationally defined as including, but not limited to, family income, occupation, education level, and social status, has been reported to affect performance on neuropsychological tests in a positive manner (Ceci & Williams, 1997; Helms, 1992; O'Bryant, O'Jile, McCaffrey, 2004). Studies have also reported discrepancies in neuropsychological test performance even when ethnic/racial groups are matched on variables associated with SES (Bjorklund & Weiss, 1985; Kaufman, McLean, & Reynolds, 1988; Manly et al., 1998b). Roberts and Hamsher (1984), for example, reported higher performance on neuropsychological measures for neuropsychologically normal Caucasians versus neuropsychologically normal African-Americans, even after adjusting for level of education. In addition, because SES comprises multiple interrelated factors (i.e., education, occupation), efforts to elucidate a direct relationship with cognition are complicated. Ethnicity, for example, has been shown to be strongly correlated with SES, in that a large portion of individuals with lower SES are ethnic minorities. This relationship between ethnicity and SES confounds analyses seeking to locate a direct relationship between SES and cognitive functioning. In addition, few studies have examined independent contributions of SES to cognitive function in adults, leaving the direct correlation between SES and cognitive functioning unexplained (Bjorklund & Weiss, 1985; Laosa, 1983). Although research with children

has shown a positive correlation between SES and both academic achievement (White, 1982) and cognitive ability (Bjorklund & Weiss, 1985; Laosa, 1983), such that children of parents in higher SES brackets had better academic performance and higher cognitive test scores than did those of parents with lower SES, the factors used to measure SES have associations with SES. In other words, factors used to measure SES are often intercorrelated. However, few studies assessing the relationship between SES and cognitive ability and /or academic achievement in adult or child samples actually demonstrate independent contributions of the multiple factors related to SES on test performance.

Normative Data Samples. Race/ethnicity related differences in neuropsychological test scores have generally been assessed using normative data samples largely comprised of Caucasian individuals (Jacobs, Sano, Albert, Schofield, Dooneief, & Stern, 1997; Miller, Bing, Selnes, Wesch & Becker, 1993; Tang, Cross, Andrews et al., 2001). In this regard, one might falsely assume that this ethnic/racial group is superior to others in neuropsychological performance. The interpretation of impairment however, depends on who the population of individuals is being compared with. However, several studies have reported lower performance by Caucasians, relative to Asians, on tests of intelligence and academic abilities suggesting that Caucasians do not exhibit exclusive superior performance on neuropsychological tests (D'Ailly, 1992; Lynn, 1996). Even so, individuals of Caucasian race comprise the majority of normative data samples against which ethnic minority performance, interpretations, and diagnoses are based. Whereas some strides (e.g., the creation of the Mayo Older African Americans Normative Study; Heaton, Grant, & Matthews, 1991; Lucas et al., 2005; Norman, Evans,

Miller, & Heaton, 2000; Unverzagt, Hall, Torke, Rediger, Mercado, Gureje, Osuntokon, & Hendrie, 1996) have been made to adjust for this lack of ethnic/racial representation in normative data samples, the majority of neuropsychological tests currently in use have demographic confounds, one of which is the impact of culture. Until the identification of factors that account for race/ethnicity-related differences are established, the use of a largely Caucasian normative dataset to assess neuropsychological dysfunction in ethnic/racial minorities may lead to misdiagnosis or misinterpretation of neuropsychological test performance in these groups.

The development of separate race/ethnic group normative data has been reviewed as a method of addressing the use of largely Caucasian standardization samples when diagnosing impairment in ethnic/racial minority populations (Gladsjo et al., 1999; Manly, 2005). This method avoids unequal comparison of racial/ethnic minority groups against Caucasian experiences, values, and performance, thus allowing for more accurate interpretation and diagnosis of impairment. Conversely, the publication of ethnic/racial normative data may not completely remedy the influence of race/ethnicity on cognitive performance. For example, separate ethnic/racial normative data samples do not address within-group differences. The education and culture of Hispanics, for example, which includes individuals from a variety of different countries (e.g., Puerto Rico and/or Mexico) may differ depending on acculturation, SES, and geographic location, thus, leaving the opportunity for continued misdiagnosis of presence and severity of neurocognitive impairment. Furthermore, use of separate standardization samples leaves the differences in neuropsychological performance between ethnic groups unexplained

and does not address the issue of the source of ethnic/racial differences and the validation of neuropsychological measures for use among ethnic/racial minorities.

Acculturation. To better understand the relationship between race/ethnicity and cognitive test performance, behavioral and attitudinal variables inherent to different racial/ethnic groups have been examined. Manly et al. (1998a) demonstrated that acculturation, defined as the level and degree to which an individual adopts the values, languages, and practices of another culture, accounted for some of the differences in neuropsychological test performance between HIV^+ (Human Immunodeficiency Virus) African-American and Caucasian adults. More specifically, healthy, neurologically normal, HIV-negative African-Americans who were less acculturated (less assimilated with mainstream Caucasian America) had lower test scores than African-Americans who showed stronger ties to their ethnicity and culture on neuropsychological tasks of verbal ability (Wechsler Adult Intelligence Scale-Revised Information and Vocabulary subtests). These differences, however, became nonsignificant after statistically controlling for age, ethnicity, and acculturation, suggesting that: (a) acculturation may account for cultural differences on neuropsychological tests between racial/ethnic groups, and (b) traditional demographic variables (i.e., age, gender, and education) may be less accurate than acculturation in the assessment and diagnosis of neuropsychological impairment (Manly et al., 1998a).

Education. Number of years of education is a strong predictor of performance on neurocognitive tests. However, neuropsychological performance among ethnic groups is confounded by education. Racial/ethnic minorities tend to have less years of formal education than Caucasians, however, in neuropsychological assessment, even when

groups are matched for education, African-Americans tend to have lower scores on both verbal and nonverbal tests (Manly et al., 1998a; 1998b; 2002; Stern et al., 1992; Welsh et al, 1995). In the present study, an individual's education level is determined by the number of years that he/she was in school. For example, an individual who completed four years of college would receive an educational level value of 16. Interpretation of this individual's cognitive performance with demographically corrected normative data would then be derived from a normative data sample with a similar education level.

Although the inclusion of number of years of education is important in the assessment of cognitive performance, number of years of education does not equate to the quality of the education. Several tests have been suggested to show strong correlations with variables associated with education (e.g., reading level), such that they may influence neurocognitive performance, interpretation, and diagnosis (Heaton, Grant, & Matthews, 1991; O'Bryant, Schrimsher, & O'Jile, 2005; Rosselli & Ardila, 1991; Ryan et al., 2005). Furthermore, recent research has reported that matching racial/ethnic groups for years of education is ineffective because it falsely assumes equivalence between number of years of education and quality of education (Baker, Johnson, Velli, & Wiley 1996; Manly et al., 2002; O'Bryant et al., 2005; Ryan et al., 2005). In addition, information relating to educational experience appears to be important in the assessment of neuropsychological performance and diagnosis when we consider the history of racism and segregation in the United States, where the vast majority of African-Americans had little or no education or choice of school, as well as decreased educational resources in their schools, as compared to Caucasians. Examination and measurement of variables more predictive of the quality of education and schooling experiences may prove to be

meaningful in explaining why ethnic minorities obtain lower scores on neuropsychological tests and, consequently, greater rates of diagnosed cognitive impairment, than simply controlling for the number of years of education. The importance of assessment of quality of education will be detailed in subsequent sections of this manuscript.

Current Study

This study will examine the impact of quality of education (QEd) on neuropsychological test performance in an HIV$^+$ sample. Currently, ethnic minorities comprise the majority of the HIV/AIDS population in the United States. The accurate interpretation of cognitive test performance is essential in an HIV/AIDS population, especially in a predominantly ethnic minority, inner city sample that already shows increased rates of depression and limited access to adequate health care. Prior research has suggested that examination of QEd in the assessment and diagnosis of cognitive impairment as a method of addressing the disparity in neuropsychological test performance among racial/ethnic minorities (Manly et al., 2002; Ryan et al., 2005). A comprehensive measurement of QEd has not yet been developed leaving the effect of educational experiences on neuropsychological test performance and diagnosis of cognitive impairment largely unexplained.

As the field of neuropsychology continues to face limitations and difficulties in accurately diagnosing cognitive functioning in normal, healthy individuals of different ethnic/racial backgrounds, the disparity in neuropsychological test performance between various racial/ethnic groups on cognitive diagnoses of impairment has been shown to extend to medically disadvantaged populations (Miller, Heaton, Kirson, & Grant, 1997; Manly et al., 1998a; Richardson, Martin, & Jimenez, et al., 2002). Neuropsychological data for this study will be collected from two HIV/AIDS (Acquired Immunodeficiency Syndrome) cohorts, the Manhattan HIV Brain Bank (MHBB) and the CNS HIV Anti-Retroviral Therapy Effects Research. These data will be used to examine the influence of

QEd on the neuropsychological performance of an HIV-positive population. QEd will be assessed using a self-report questionnaire developed for this study.

Review of the Literature

Ethnic Group Differences in Cognition and HIV/AIDS

Overview. HIV/AIDS is affecting ethnic and racial minorities in the United States at an accelerated rate (CDC, 2005). Although Caucasians represent the majority of the United States population, the highest rates of death due to infections secondary to this disease are not for Caucasians but for ethnic/racial minorities. The disparity in infection rates among ethnic/racial groups is alarming. The disparity in neuropsychological test performance between cognitively normal ethnic/racial minority (i.e., African-American and Hispanic) and Caucasian individuals is also evident in the literature pertaining to both neuropsychology and HIV/AIDS. The variance in neuropsychological test performance among racial/ethnic groups and the impact of demographic diversity and culture on healthcare have important clinical implications for the diagnosis, care, and treatment of disease-related impairment. The racial/ethnic group differences in neuropsychological performance reported in a normal, healthy population are intensified in the HIV/AIDS populations. Findings show lower neuropsychological performance for HIV^+ African Americans versus HIV^+ Caucasians (05.-1SD; Miller, Heaton, Kirson, & Grant, 1997; Manly et al., 1998a) and Hispanics (05.-1SD) (Richardson, Martin & Jimenez, et al., 2002). Furthermore, after finding that HIV^+ Hispanics consistently performed below Caucasians on tests involving verbal skills, Levin et al. (1992) suggested inappropriateness in the use of native HIV^+ English-speakers as a standardization sample for HIV^+ participants whose first and primary language may not have been English. This significant difference in neuropsychological test performance between groups suggests that factors inherent to race/ethnicity (e.g., language and

culture), if examined thoroughly, might contribute to the discrepancies reported in the literature.

To better understand the neuropsychological effects of HIV/AIDS in this evolving population, a review of the (a) epidemiology and demographics, (b) neuropathological findings (c) transmission and risk groups and (d) neurocognitive effects of HIV/AIDS, follows.

Epidemiology and Demographics of HIV in the United States

The HIV/AIDS epidemic has been a global threat for the past 20 years. The term HIV/AIDS refers to individuals diagnosed with HIV, regardless of their AIDS status. The incidence of HIV/AIDS has steadily increased since the Centers for Disease Control (CDC) first published their report of pneumocystis carinii pneumonia in a sample of five homosexual men in San Francisco in 1981 (Centers for Disease Control and Prevention, 1981a). By the end of 1983, over 2000 cases had been reported across 39 states within the Unites States (U.S.) and over 100 cases abroad (Fauci et al., 1984).

The CDC estimated that there were approximately 800,000 to 900,000 people living with HIV in the United Stated in 2000 with about 40,000 new infections annually (Centers for Disease Control and Prevention, 2005). Among those infected, 70% were men, with men who have sex with men (MSM) representing 42% of new infections and heterosexual men accounting for one-third of new infections. A quarter of Americans with annual new infections are intravenous drug users (IVDUS). Although only 13% of the U.S. population in the year 2000 was African-American, more than half of annual new HIV infections occurred in this subgroup, whereas 26% were Caucasian and 19% were of Hispanic origin (Centers for Disease Control and Prevention, 2005). From the

year 2000 through 2003, the number of new cases of HIV/AIDS has continued to increase, with African-American and Hispanics disproportionately affected. In 2003, the number of new incidences of HIV among African-Americans and Hispanics was significantly higher than among any other racial/ethnic group (Centers for Disease Control, 2005).

HIV/AIDS rates and incidences vary not only by race, but also by gender. In 2003, the rate of HIV/AIDS diagnosis in men increased to 72%, with the rate of infection in African-American men approximately three times greater than in Hispanics and seven times that of Caucasians (Centers for Disease Control and Prevention, 2005). African-American women, on the other hand, accounted for approximately 69% of women diagnosed with HIV/AIDS. Whereas the incidence of HIV/AIDS among African-American women in 2003 was similar to that of African-American men, the rate of HIV/AIDS diagnosis among African-American women was five times greater for Hispanic women and 18 times that of their Caucasian counterparts. In sum, while the incidence of HIV/AIDS increased among minorities (African-American and Hispanic) in 2003, the contrary was true for Caucasians who experienced a decrease in the number of new infections (Centers for Disease Control and Prevention, 2005).

New York City (NYC) is the epicenter of the HIV/AIDS epidemic in America. Of the top five most populated states (California, Texas, New York, Florida, and Illinois), New York State has the third highest population of individuals living with AIDS (Centers for Disease Control and Prevention, 2005). In fact, at the end of 2003, New York City, specifically, not only had the largest incidence of HIV^+ cases (5,580, regardless of AIDS status) within all of New York State, but also in comparison to San Francisco (767),

Dallas (745), Miami (1,072), and Chicago (1,527) combined (Centers for Disease Control and Prevention, 2005).

New York City's 2003 incidence report of HIV among minorities is parallel to that of the United States. Together, African-Americans and Hispanics represent 80% of New York City's HIV-infected population. Trend statistics from the CDC (2005) showed that within NYC, HIV/AIDS disproportionately affects African-American and Hispanic men between the ages of 25-49 (73%: Centers for Disease Control and Prevention, 2005). Sixty-seven percent of those infected are men, with 31% being MSM. By contrast, women represent less than one-third of those infected with HIV/AIDS (Centers for Disease Control and Prevention, 2005).

Neuropathology of HIV/AIDS

HIV is a retrovirus -- an RNA virus which transcribes DNA from an RNA template, thus allowing a stable viral infection of targeted cells. CD4 positive T-cells and macrophages are the two major target cells of HIV-infection. CD4 T-cells are essential to the functioning of the immune system. They help to destroy cells that express foreign antigens and help to promote antibody production. In HIV-infected CD4 cells, the cells are unable to respond and counteract the HIV infection itself, thus, there is resulting depletion of CD4 cells and subsequent immunodeficiency. With the depletion of CD4 cells, cell-mediated immunity is damaged, and opportunistic infections and tumors can arise. When an HIV^+ individual's CD4 cell count is below 200/µL of blood (the average healthy individual count is approximately 1200/µL) and/or opportunistic illnesses occur, the HIV infection has progressed to AIDS (CDC, 2003; Perry, Lawson, & Reid, 1994; Weiss, 2000).

HIV invades the central nervous system (CNS) and causes progressive cognitive and motor impairment in HIV-infected individuals. Either CD4-positive T-cells or macrophages may enter the CNS by crossing through the blood-brain and blood-cerebrospinal fluid (CSF) barriers (Gendelman, Lipton, Tardieu, Bukrinsky, & Nottet, 1994; Navia, Cho, Petito, & Price, 1986b). Unlike CD4 cells which become depleted after infection with HIV, infected macrophages act as reservoirs for HIV (Herbein, Coaquette, Perez-Bercoff, & Pancino, 2002; Perry et al., 1994). Macrophages contribute to the establishment and continuity of HIV-infection in the CNS, taking on the role of a Trojan horse by spreading HIV to uninfected nervous system tissues (Herbein et al., 2002; Perry et al., 1994). The continuous activation of macrophages leads to the upregulation of proinflammatory chemokines and cytokines, which account for HIV encephalitis (HIVE) in the CNS and are thought to be essential in the generation of HIV-associated cognitive and behavioral deficits (Fisher-Smith, Croul, Adeniyi, et al., 2004; Glass, Fedor, Wesselingh, & McArthur, 1995; Verani, Gras, & Pacino, 2005).

HIVE, characterized by an accumulation of macrophages, multinucleated giant cells, and microglial nodules, often presents with HIV-associated cognitive and motor dysfunction. However, not all individuals with cognitive impairment will demonstrate HIVE, which in untreated disease is present in only 50% of individuals dying with cognitive changes (Navia et al., 1986b). Approximately one quarter of HIV^+ individuals develop minor cognitive motor disorder (MCMD), and approximately 15% of those with AIDS develop HIV-associated dementia (HAD) (Navia et al., 1986b; Sacktor & McArthur, 1997).

Simian immunodeficiency virus (SIV) infection of rhesus macaques offers the best model of HIVE and HIV/AIDS infection in humans (Fischer-Smith et al., 2004; Weed et al., 2003; Zink & Clements, 2002). The SIV model of HIV infection displays both CNS pathology and cognitive and motor impairments similar to these seen in HIV-infected individuals (Gendelman et al., 1994; Murray, Rausch, Lendvay, Sharer, & Eiden, 1992; Zink et al., 1997). Weed et al.'s (2003) use of the SIV in rhesus macaques showed progression from HIV to AIDS within 3 months and CNS damage mediated by the host's immune responses. This model also demonstrated replication of HIV along with increased macrophages and CNS inflammation parallel to what is seen in HIVE in humans (Weed et al., 2003). Pathological characteristics of this SIV model were also accompanied by clinical/behavioral deficits typical of HIV individuals, including a general decrease in motor activity, bi-manual fine motor coordination, and decreased reaction time, all characteristics of MCMD and HAD (Weed et al., 2003). These findings were consistent with similar studies which found correlations between increased macrophages and microglia in SIV models of HIV infection and encephalitis, as well as impaired motor activity (Gold et al., 1998; Horn et al., 1998; Zink et al., 1997).

While the SIV model of HIV/AIDS infection in rhesus monkeys has been a reliable approach for examining neuropathological and behavioral abnormalities characteristic of HIV infection in a more condensed period of time than is seen in humans, several disadvantages exist for this model. The amount of cognitive and clinical deficits demonstrated in SIV models is contingent on the length of time that the animal survives following infection, scheduled times of euthanasia, and termination of observation following proof of hypotheses, and thus may not accurately reflect the extent of

behavioral changes and/or may preclude the presence of additional behavioral/cognitive impairments (Weed et al., 2003). Furthermore, while the SIV model demonstrates similar neuropathological and behavioral deficits parallel to those seen in HIV-infection, it does not allow for the study of possible confounds related to higher order processes in cognitive dysfunction in man. For example, effects of socioeconomic status and ethnic or culture disparities have not been modeled in SIV HIVE animal systems pertinent to HIV. Thus, the complex diagnosis of HIV-impairment through neuropsychological and functional assessment of underserved populations has no laboratory model, and must then proceed through observational studies of human cohorts. The focus of this paper derives from such observational analysis.

Risk Groups and Transmission

Several major risk groups for HIV/AIDS exist across the Unites States (Centers for Disease Control and Prevention, 2005). Men who have sex with men constitute the largest risk group, whereas intravenous drug users, heterosexuals, and individuals with minority status also appear to have a high prevalence for HIV/AIDS (Bogart et al., 2005; Centers for Disease Control and Prevention, 2002, 2005; Kral et al., 2001; Somlai, Kelly, McAuliffe, Ksobiech, & Hackl, 2003).

The CDC (2000) estimated that more MSM have died from AIDS than all other risks groups combined, with ethnic/racial minorities representing a large percentage of those infected. Results from the Young Men's Survey (YMS), a longitudinal study of the effects of HIV, sexual behaviors, substance use, and other psychosocial factors among MSM, found a high prevalence of HIV among 15-22 year-old MSM in seven cities across the United States (Centers for Disease Control and Prevention, 2001). The prevalence of

HIV infection among the young MSM sampled in this study rose with age and was higher among minorities (African-Americans, Hispanics, and men of mixed race) than among Caucasians and Asian/Pacific Islanders (Centers for Disease Control and Prevention, 2001). Data from the Young Men's Study also showed that of a 92% African-American MSM sample, 16% tested positive for HIV. Of those who tested positive for HIV, 93% were unaware of their status (Centers for Disease Control and Prevention, 2001, 2002). Similar findings in a study by Catania et al. (2001) revealed intravenous drug use and minority status to be major predictors of HIV infection.

Method of transmission is important in the review of factors that may affect progression of HIV/AIDS. The primary method of HIV transmission is via sexual intercourse, particularly through penile-anal and penile-vaginal intercourse (Rothenberg, Scarlett, del Rio, Reznik, & O'Daniels, 1998). In rare instances, female-to-female transmission of the virus has been documented (Monzon & Capellan, 1987). HIV is also spread by the sharing of needles/syringes with an HIV^+ individual, from HIV^+ mothers to their children during pregnancy or breast-feeding, and via parenteral interaction of blood or blood byproducts, that is, the administration of a substance into the body by means other than through the digestive tract (Glasner & Kaslow, 1990; Weinbreck, Loustaud, Denis, & Liozon, 1988). Although HIV has been detected in several other bodily fluids, such as semen, vaginal secretion, urine, tears, and saliva, no report of transmission has been found from contact with these fluids (Levy, Shimabukura, Hollander, Mills, & Kaminsky, 1985; Sarngadharan, DeVico, Bruch, Schupbach, & Gallo, 1984; Vogt et al., 1986).

Research studies have shown that even after the discovery of HIV/AIDS, high-risk practices and behaviors displayed by IVDUs have continued to increase (Rhodes, Stimson & Quirk, 1996; Strathdee et al., 2001; Watters, 1994). IVDUs are at great risk for HIV infection not only because of the risks associated with sharing HIV-contaminated syringes/needles, but due to the risky sexual activity associated with drug use among this population (Kral et al., 2001; Somlai et al., 2003; Strathdee et al., 2001). Risky sexual activities typical for IVDUs include sex work, multiple or concurrent sexual partners, and unprotected vaginal and anal intercourse (Bogart et al., 2005; Kral et al., 2001; Somlai et al., 2003; Morris & Kretzschmar, 1997; Strathdee et al., 2001). Bogart et al. (2005) examined the levels and predictors of sexual risk among a sample of 1445 HIV^+ male and female IVDUs recruited from syringe exchange programs. Results of this study found that nearly half (41%) of those sampled reported sharing syringes as well as engaging in high-risk sexual activity (Bogart et al., 2005). Molitor et al.'s (1999) study replicated the findings in Bogart et al.'s (2005) study; a positive association between IVDU and high-risk sexual behavior was also found to exist.

Definitive reasons for the increased risk of HIV/AIDS among African-American and Hispanic males are unknown. Previous studies showed that although African-American male IVDUs were at a higher risk of acquiring HIV/AIDS, Caucasian IVDUs had a greater number of shared syringes/needles with a greater number of partners (Chaisson, Moss, Onishi, Osmond, & Carlson, 1987; Friedman et al., 1987). The high rate of HIV infection among ethnic/racial minorities who concomitantly abuse drugs and engage in high risk sexual activity lends support to the need for additional methods of assessing this group. Because ethnic/racial minorities also evidence lower levels of

education and socioeconomic status than Caucasians, research into the influence of educational quality and other risk factors (e.g., substance abuse and sexual activity) on the neuropsychological test performance of this group is pertinent.

Neuropsychological Effects of HIV

Overview. Approximately one-third of HIV/AIDS individuals demonstrate neuropsychological deficits throughout the course of the disease (Heaton, Grant, & Matthews, 1991; Heaton et al., 1993; Hinkin et al., 2002; Martin et al., 1998; Martin et al., 2001). Grant et al. (1999) reported twice the risk of neuropsychological impairment in individuals with HIV as compared to seronegative controls (35.3% versus 17.0%). The course of neuropsychological disorder may vary, in part due to practice effects engendered from multiple test administrations or to natural causes of HIV-infection. HIV-related cognitive impairment is most notable in the latter stages of infection and is attributed to dysfunction in frontal-subcortical regions, specifically the basal ganglia and frontal cortex, as well as hippocampal regions. HIV-related diagnoses of cognitive impairment range from mild cognitive deficits to severe HIV-associated dementia (HAD; Janssen, Cornblath, & Epstein, 1991; Navia, Jordan, & Price, 1986a). As the disease progresses, the risk for cognitive impairment and HAD increases, however, HIV-associated impairment does not always follow a linear course (Berger & Nath, 1997; Carter, Rourke, Murji, Shore, & Rourke, 2003; Grant, Marcotte, Heaton, & the HNRC Group, 1999; Navia, Cho, Petito, & Price, 1986b).

HIV-associated neuropsychological impairment is typically observed in the domains of learning, abstract/executive functioning, attention/working memory, speed of information processing, and motor functioning (Basso & Bornstein, 2000; Berger & Nath,

1997; Heaton et al., 1995; Heaton et al., 1991; Hinkin et al., 2002; Martin et al., 2001). A study by Heaton et al. (1995), with a sample of 267 HIV+ positive individuals found that the most common domains of impairment were learning (68%), abstract/executive functioning (54%), attention/working memory (53%), motor functioning (47%), and speed of information processing (36%). Less impaired areas included verbal fluency (27%) and delayed recall (25%).

HIV-associated cognitive disorders can be divided into four categories: subsyndromic, minor cognitive motor disorder (MCMD), HIV-associated dementia (HAD), and neuropsychologically impaired - other (Grant, Marcotte, Heaton, & the HNRC Group, 1999; Woods et al., 2004).

Subsyndromic. Neuropsychological impairment in at least two neuropsychological domains with intact activities of daily living defined as subsyndromic. In other words, an individual diagnosed as subsyndromic would typically report no influence of cognitive problems in his or her day-to-day functioning.

MCMD. Approximately 30% of HIV-infected individuals are diagnosed with minor cognitive motor disorder (MCMD; Sacktor et al., 2002). MCMD is characterized by neurocognitive impairment in two or more domains, typically attention, memory, and speed of information processing, that result in mild impairment in work or activities of daily living (e.g., cooking and dressing) attributed, in part, to cognitive dysfunction (American Academy of Neurology AIDS Task Force, 1991; Grant, Marcotte, Heaton, & the HNRC Group, 1999). HIV-infected individuals with MCMD typically have normal neurological, neuroimaging, and mental status exams (American Academy of Neurology AIDS Task Force, 1991). The incidence of MCMD has been shown to be highly

correlated with the onset of dementia, however, the transition from MCMD to HAD is not definitively unidirectional. For example, within the Northeastern AIDS Dementia cohort (NEAD), over a third of the sample showed progression from a demented status to MCMD, however, nearly half of the cohort showed rapid (e.g., 6 months) decline from a nondemented state to HIV-associated dementia (McArthur et al., 2003).

HAD. Unlike MCMD, HIV-associated dementia (HAD) is accompanied by behavioral change and a greater degree of impairment in activities of daily living (ADLs) and neuropsychological function (American Academy of Neurology AIDS Task Force, 1991; Woods et al., 2004). HAD typically occurs in the later stages of HIV infection. Its clinical, motor, and behavioral manifestations are sufficient for an AIDS diagnosis (American Academy of Neurology AIDS Task Force, 1991; Navia, Jordan, & Price, 1986a). Initial neuropsychological deficits characteristic of HAD include memory loss, psychomotor slowing, and difficulty with fine motor movement. As the dementia increases in severity, more global dysfunction is evident, resulting in an inability to perform ADLs. The bedside mental status exam of an individual with HAD may reveal deficits in concentration, attention, and memory, as well as slowed speech, flattened affect, and aphasia whereas the neurological exam frequently shows abnormality of gait, frontal release signs (e.g., snout and glabellar), hyperreflexia, and peripheral neuropathy (American Academy of Neurology AIDS Task Force, 1991; Navia, Jordan, & Price, 1986a).

Neuropsychological Impairment-Other. A diagnosis of neuropsychological impairment-due to other causes, is given when comorbid conditions (e.g., substance abuse, low premorbid intelligence, and/or learning disability) account for or contribute to

neuropsychological impairment in an HIV^{+} population. This diagnosis is assigned with or without a report of disturbance in day-to-day functioning (Woods et al., 2004).

Estimates of 30-50% of advanced HIV/AIDS individuals show neuropsychological deficits of one or more types over the course of the disease (Heaton et al., 2001; Hinkin et al., 2002). Not all individuals with HIV, however, fall into one of the aforementioned neuropsychologically impaired categories. Some individuals evidence neuropsychological impairment in one or fewer cognitive domains with no reported disruption of daily living. This profile would result in a diagnosis of neuropsychologically normal (NP normal).

Neuropsychiatric and Psychosocial Effects of HIV

Adults with HIV/AIDS struggle with psychological, as well as psychosocial and psychiatric, sequelae related to diagnosis, progression of illness, and mortality. Unlike acute medical conditions, individuals with HIV/AIDS grapple with adapting to an unpredictable course of health and employment concerns. Literature in this area reports problems with self-image, self-respect, discrimination, and disability (Dickey, Dew, Becker, & Kingsley, 1999; Hoffman, 1997). A misdiagnosis of cognitive impairment can worsen an already decreased self-image, emotional and physical burden, and a high degree of depressive symptomatology in an HIV^{+} individual.

Neuropsychiatric changes have also been examined within the HIV/AIDS population (Bing et al., 2001; Kermani, Borod, Brown, & Tunnell, 1985; Koutsilieri, Scheller, Sopper, Meulen, & Riederer, 2002). Whereas the prevalence of psychiatric disorders in HIV/AIDS patients is related to numerous factors including disease stage, treatment compliance, and access to adequate health care, the incidence rate in HIV-

infected individuals ranges from 0.5 to 15% (Koutsilieri et al., 2002; Sewell et al., 1994). HIV-related psychiatric symptoms typically include mood disturbance most commonly depression (Kermani et al., 1985; Koutsilieri et al., 2002). The presence of psychiatric disorders within the HIV/AIDS population is important when assessing treatment compliance, employment, and risky behavior. It is also important to consider the presence of psychiatric complications in the diagnosis of cognitive impairment within a racial/ethnically diverse HIV^+ sample which is confounded by factors such as level of education, culture, and SES because of the variance that can occur in each factor within a minority sample. This variance can influence diagnosis of cognitive impairment if not properly controlled for.

Depressive disorders have been reported to affect 4-14% of the HIV^+ population, with higher rates occurring in HIV clinics, populated by large numbers of inner city minorities and intravenous drug users (Brown et al., 1992; Chuang, Jason, & Pajurkova, 1992; Gala et al., 1993; Lyketsos, Hanson, Fishman, McHugh, & Treisman, 1994). Whereas some studies have reported no relationship between rates of depression and the stage of HIV infection (Atkinson et al., 1988; Lyketsos & Federman, 1995), others have reported higher rates of depression in the later stages of HIV infection (Hoover, Saah, Bacellar, Detes, & Phair, 1992; Maj et al., 1994; Rosenberger, Bornstein, & Nasrallah, 1993). Depressed HIV^+ individuals appear to have decreased perceived health, worse physical and social functioning, greater physical pain, significant physical morbidity, an increased level of anxiety, and decreased adherence to medication regimen relative to HIV-negative individuals, with HIV^+ women evidencing high rates of depression (Cook et al., 2002a; Cote, Biggar, & Dannenberg, 1992; Ickovics, Druley, Morrill, Grigorenko,

& Rodin, 1998; O'Dowd, Biderman, & McKegney, 1993; Wells et al., 1989). In addition, Lyketsos et al. (1996) reported higher rates of depression and suicidal ideation within an unemployed HIV^+ sample.

Studies have shown a link between high levels of optimism, social support, positive coping styles, and better health in an HIV-infected population (Dunkel-Schetter, & Bennett, 1990; House, Umberson, & Landis, 1988; Segerstrom, Taylor, Kemeny, & Faher, 1998). Furthermore, as the risk and incidence of HIV infection increases within low income and racial/ethnically diverse communities, understanding HIV's social and psychological effects on adjustment, coping, and emotional stability is critical (Centers for Disease Control and Prevention, 2002, 2005). Results from a study of a multi-ethnic, community-based sample of HIV^+ individuals from the Women and Family Project (WFP) in Los Angeles County revealed a main effect of ethnicity on depression such that HIV^+ African-American women showed higher levels of depression as compared to HIV^+ Caucasian and Hispanic women (Gurung, Taylor, Kemeny, & Myers, 2004). Further analyses revealed that variables associated with "chronic burden" (e.g., child care problems, not having enough money to cover basic needs, and being fired or laid off), poor social support, and decreased use of coping strategies were significant factors contributing to depression among African-American and Hispanic participants. A 6-month follow-up revealed that chronic burden was a significant predictor of increased depressive symptomatology within African-American participants. Results from the Gurung et al. (2004) study are consistent with research showing that higher levels of optimism and social support are associated with lower levels of depression and higher

levels of chronic burden are associated with lower social support and use of more avoidant coping strategies (Moos & Schaefer, 1993).

The incidence of HIV/AIDS is steadily rising within racial/ethnic minorities and is one of the leading causes of death among women (Centers for Disease Control, 2002; 2005). This epidemic disproportionately affects low-income minority communities (Centers for Disease Control, 2002; Rosenberg & Biggar, 1998). According to Pearlin and Schooler (1978), chronic burden (defined as ongoing difficulty in social roles, employment, finances, parenting, and marriage) and being single, separated, or divorced contribute to both psychological stress and decreased health by reducing the immune system's ability to respond to a virus. Several studies report chronic burden to be a variable that considerably affects the lives of HIV-infected women because they face difficulties with finances, drug use, employment, maintaining relationships, and raising children (Jenkins & Coons, 1996; Gurung et al., 2004). This population faces a dire degree of stress including but not limited to healthcare access, social stigma, employment, and social support above and beyond acquiring HIV (Jenkins & Coons, 1996; Jillson-Bostrom, 1992). The diagnosis of HIV-related cognitive impairment can intensify the chronic burden already existing within this population and contribute to increased depressed mood and disease progression (Gurung et al., 2004).

In sum, reports of chronic burden within an HIV-infected population underscore the importance of proper diagnosis of cognitive impairment. Chronic burden contributes to employment status, access to social security and disability benefits, social support, the ability to care for oneself and for family, available strategies for coping, and depression. An inaccurate diagnosis of cognitive impairment may exacerbate the psychological

distress already rising in this population and also may increase the degree of chronic burden already present in attempting to live and cope with HIV/AIDS.

Functional Effects of Cognitive Impairment in HIV

HIV-related cognitive deficits can significantly influence an individual's ability to perform everyday tasks. In general, it has been shown that performance on neuropsychological tests is important in the ability to function in activities of daily living (ADLs; Heaton & Pendelton, 1981). As the level of cognitive impairment increases, so does the ability to perform well at work or home decreases. Literature examining the association between HIV-related cognitive deficits and everyday functioning has shown that neuropsychological impairment can have a negative effect on ADLs, employment status, and self-perceived work ability (Heaton et al., 2004; Marcotte, et al., 1999). Grant et al. (1999) reported that among the HIV^+ participants, the unemployment rate for neuropsychologically impaired individuals was three times that of neuropsychologically normal individuals (27% versus 10%). Among the neuropsychologically impaired but employed individuals, 30% reported difficulties in their jobs (Grant et al., 1999). In addition, in a sample of 89 HIV-negative and 252 HIV^+ men, Heaton et al. (1993) found that neuropsychological impairment was a significant predictor of unemployment. Furthermore, Heaton et al.'s study (1993) demonstrated that a self-perceived decrease in work ability was five times greater within the HIV^+ neuropsychologically impaired group as compared to the HIV^+ neuropsychologically normal subjects. Thus, not only was greater neuropsychological impairment a significant predictor of unemployment, but for HIV^+ individuals who were currently employed but experiencing cognitive problems, their perception of work performance was lower than for neuropsychologically normal

HIV$^+$ participants. This perception of work performance can be attributed to a myriad of factors including fatigue, changing medical status, physical and cognitive limitations, side effects of medications, and numerous medical appointments (Hoffman, 1997).

In sum, employment status appears to be a prominent concern for HIV$^+$ individuals as employment offers financial stability, role identity, and purpose in life (Hoffman, 1997). Unemployment, in turn, appears to have deleterious psychological effects on individuals infected with HIV. Therefore, the risk of misdiagnosis of cognitive impairment not only has the potential to financially jeopardize an individual's daily living functions and resources, but can cause psychological damage in terms of how an individual perceives his or her level of functioning. Psychosocial consequences are certain to be impacted by a misdiagnosis of cognitive impairment in this medically unstable population.

Methods to Address Ethnic/Racial Disparities in Neuropsychological Performance

According to Lezak (1995) and Spreen and Strauss (1998), accuracy in neuropsychological assessment relies on the use of appropriate standardization samples. However, most neuropsychological tests are age- or education-adjusted and are derived from a majority Caucasian sample. This presents a challenge in the assessment of racial/ethnic minority individual's presence or degree of impairment when these variables are evaluated against a predominantly Caucasian standardization sample that does not adequately represent the individual. Thus, the potential for inaccuracy in the diagnosis of ethnic/racial minority patients can be confounded by demographic and cultural variables (Manly et al., 1998b, 2002; Patton et al., 2003). The following sections will review three methods of addressing the discrepancy in neuropsychological performance between

ethnic minorities and their Caucasian counterparts: demographically corrected normative data, separate norms for racial/ethnic groups, and the use of literacy as a proxy for quality of education.

Demographically Corrected Normative Data. Demographically corrected normative data has been suggested as one method of addressing the misdiagnosis of minorities in neuropsychological testing (Heaton et al., 1991; Tulsky & Price, 2002). These normative data typically provide standardization scores that correct for multiple demographic factors such as gender, age and education. Manly et al. (1998b), however, argue that because the normative samples of these groups are largely Caucasian, the contribution of ethnicity continues to be unrecognized and the likelihood of misdiagnosis of cognitive impairment for ethnic minorities continues to exist.

Separate Ethnic Group Normative Data. The development of separate ethnic group normative data would provide a dataset from one racial/ethnic group. Only data from individuals of the same race or ethnicity as the normative data sample would be used in the assessment of cognitive performance. Currently, the majority of neuropsychological normative data sets have been derived from Caucasian participants and, therefore, do not accurately represent racial/ethnic minorities. Comparing individuals to members of their own ethnic group would decrease ethnicity-related difference (assuming similar experiences, education level, etc.), and, thus, lead to improved accuracy in the diagnosis of cognitive impairment.

The development of separate group normative data is not without itsdrawbacks. For one, separate normative data sets do not attempt to explain the reasons why neuropsychological performance differences exist among ethnic groups. Secondly,

race/ethnicity is a term that lacks scientific consistency (Kaplan & Bennett, 2003). Some studies define African-Americans as those who were born in the U.S. but have African heritage. Others include those of African descent who were born in the Caribbean and identify themselves as West Indian. In order to gain accuracy in diagnoses, racial classifications would have to be built into the development of separate racial/ethnic group normative data sets and even so, the assessment of those of biracial or mixed race, a population that is steadily growing within the U.S., under one racial category would not be appropriate. Thus, further examination is needed to address the methods by which those of mixed races and/or multiple cultural backgrounds would be assessed if separate racial/ethnic group normative data sets were to be developed.

Literacy. Literacy, in this study, will be used interchangeably with the term reading level. Literacy is defined here as the ability to read or use language in order to read at a level sufficient for communication. The source of the disparity in neuropsychological test performance among racial/ethnic groups (e.g., African-Americans and Hispanics versus Caucasians) has been researched through examination of reading level/literacy (O'Bryant et al., 2005; Manly et al., 2002; Ryan et al., 2005). Reading level is associated with academic achievement and educational resources and has been used in studies with racial/ethnic minorities who have discrepant reading and education levels (Hedges, Laine, & Greenwald, 1994; Wilkinson, 1993). Using reading ability as a proxy for educational quality, Manly et al. (2002) showed that adjusting for reading level decreases racial/ethnic group differences in neuropsychological test performance in an elderly ethnic cohort and therefore may provide a more accurate depiction of cognitive performance than number of years of education.

A study conducted by the Manhattan HIV Brain Bank examining the role of education and reading level, assessed by the reading subtest of the Wide Range Achievement Test-3rd Edition (WRAT-3; Wilkinson, 1993), found that among 212 participants, 50% had less than or equal to an 8th grade reading level though only 5% had less than or equal to an 8th grade education (Ryan et al., 2005). This study also reported that African-American and Hispanic participants had lower education and reading levels compared to Caucasians. Additionally, African-American and Hispanic participants showed more discrepancy between reading and education level than did Caucasian participants, and the discrepancy between reading and education level was related to decreased neuropsychological impairment. This study highlighted the importance of literacy as a factor in the interpretation and assessment of cognitive functioning and suggested the examination of educational experiences to explore the discrepancy between reading and education level.

O'Bryant, Schrimsher, and O'Jile (2005), also utilizing the Reading Subtest of the WRAT-3 to ascertain reading level in 195 (133 Caucasians and 62 African-American) neurologically normal participants, found that self-reported years of education overestimated actual reading level in the African-American minority group. Therefore, actual number of years of formal education did not equate with tested reading grade level. This effect has been hypothesized to occur due to disparities in educational experience among different ethnic/racial groups. Thus, matching groups on years of formal education attained does not necessarily equate with the quality of education obtained, as measured by literacy/reading level.

It is important to note that many Americans have low literacy. The National Adult Literacy Survey reported that 21% of American adults perform at the lowest literacy level (Kirsch et al., 2003). Results of this survey also demonstrated that at the lowest levels of literacy, ethnic/racial minorities were overrepresented as compared to Caucasians (Kirsch et al., 2003). Several other studies have reported that ethnic minorities have reading levels below that of their self-reported education level (Albert & Teresi, 1999; Baker, Johnson, Velli, & Wiley, 1996). This overrepresentation of ethnic/racial minorities at the lowest level of literacy may be due to differences in educational quality. Therefore, while it is common for researchers to match racial/ethnic groups on education level prior to assessing cognitive functioning, within a low literacy population, education-corrected normative techniques may encourage misdiagnosis of impairment by assuming that the *quantity* of education is synonymous with the *quality* of education obtained among groups. Furthermore, while assessment of reading level has shown attenuation of ethnic group differences in neuropsychological performance, simply assessing one's literacy does not account for differences in educational resources, teacher quality, and overall quality of educational experience obtained throughout schooling.

Quality of Education (QEd)

Overview. Assessing variations in QEd appears to be more relevant in disentangling neuropsychological differences in test performance between ethnic minorities and Caucasians than reading level and non-operationalized factors inherent to culture and ethnicity (i.e., religion, traditional practices), especially in a low-educated, medically challenged, ethnic minority population with discrepancies in education and reading level.

HIV/AIDS, once thought to be a disease characteristic of homosexual, Caucasian men, currently affects over 800,000 Americans, with ethnic/racial minorities disproportionately imapcted. As the face of HIV/AIDS has changed over the past two decades, so should the method of assessing this new population. Several studies of non-HIV infected populations have reported lower verbal and nonverbal performance among racial/ethnic minorities compared to Caucasians even when groups are matched for years of education (Manly et al., 2002, 2003; Welsh et al., 1995). This difference in performance between groups has been suggested to stem from a disparity in the quality of education obtained by ethnic/racial minorities and Caucasians. QEd, defined in the current study by school characteristics and experiences, including teacher quality, student/teacher ratio, and availability of academic resources, has been shown to account for some of the differences in academic achievement as well as variation in scores on neuropsychological tests between ethnic/racial minorities and Caucasian Americans (Epstein, 1987; Fehrman, Keith, & Reimers, 1987; Ryan et al., 2005; Sui-Chi & Willms, 1996). Therefore, incongruent quality of educational experiences, resulting in discrepancies in arithmetic, problem-solving, and reading skills, may influence the disparity seen between ethnic/racial minorities and Caucasians on neurocognitive measures.

The current study is dedicated to examining the impact of QEd on neuropsychological test performance. Past studies have not utilized a comprehensive assessment of educational quality. In this study, QEd, will be measured using a questionnaire comprised of items addressing several components of educational quality

reviewed in the literature. The following review will cover some of the variables associated with QEd and examine their use in the existent literature base.

Standardized Testing. Within an academic setting, standardized tests are generally composed of two forms -- aptitude tests and achievement tests. Aptitude tests are used to predict the level at which a student will perform in a subsequent educational setting while achievement tests measure acquired or general knowledge (Popham, 1999). Over two-thirds of states across the U.S. use standardized tests to assess student performance as well as general educational achievement (Wolk, 1998). When asked whether standardized tests were effective indicators of educational quality, nearly a third of educators and parents agreed that these tests should be used to measure QEd (Bauer, 1999). Advocates reasoned that the items on achievement tests not only adequately reflect important content but that they measure what is taught by teachers in school. In general, standardized tests are justified as appropriate measures of educational quality because of their cost effectiveness, easy implementation, and straight-forward interpretation of results. Furthermore, Linn (1999) argues that achievement tests have been socially accepted as measures of the QEd obtained by a student. Opponents of standardized tests, however, argue that they encourage “teaching to the tests” and affect the quality of teachers and teaching style rather than actually measuring the QEd received by students (Bauer, 1999; Corbett & Wilson, 1991; Popham, 1999; Wolk, 1998).

Teacher Quality. The impact of qualified versus less qualified teachers on the achievement of students has long been debated. Studies from the education literature have reported an increase in less experienced and less qualified instructors teaching more disadvantaged students (Darling-Hammond, 1998; Stover, 1999). According to the

National Center for Education Statistics, students enrolled in high-poverty schools containing a majority of ethnic/racial minority students have a 50-100% chance of being taught by a teacher without appropriate training in his or her intended subject or who lacks certification (Evans, Stewart, Mangin, & Bagley, 2001; The Education Trust, 2000). Additionally, when a sample of New York high school teachers was surveyed, two-thirds of those who taught at high-poverty schools considered themselves as unprepared to teach their intended subject (Carroll, Fulton, Abercrombie, & Yoon, 2004). Because teachers are a direct source of educational attainment for students, it is assumed that high student achievement, to some degree, is associated with the quality of one's teachers. Therefore, the discrepancy between academic grade level and quality of education may, in part, be attributed to an inadequate and/or uncertified teaching staff.

Student/Teacher Ratio. Literature examining the components of QEd has identified teacher/student ratio as an important indicator (Barker and Gump, 1964; Griffith, 1998). An overwhelming amount of education and organizational psychology research has reported a negative correlation between large student-to-teacher ratios and the QEd obtained by students as manifested by low test scores, reduced student participation, and less individualized student recognition/attention (Barker & Gump, 1964). Barker and Gump (1964) reported that although bigger schools (which typically implies larger student/teacher ratios) were structurally appealing, smaller schools with lower student/teacher ratios offered personal relationships between school faculty and students (as well as faculty and parents), more individualized attention to students, and produced higher student morale. Interestingly, Griffith (1998) reported greater parental participation in schools that parents believed had larger student/teacher ratios but low

overall QEd and achievement. This finding highlights the willingness of parents to be more involved in their childrens' education when they perceive them not to be gaining individualized attention and receiving lower quality education.

Condition of Academic Facilities. Another indicator of educational quality is the condition of academic facilities (e.g., classrooms and bathrooms) (Carroll et al., 2004; Carey, 2004). Research shows that to reach the same standards as low-poverty schools (defined as schools that rank in the top 25% of those whose total household income falls below the poverty line), high-poverty schools require additional funding and materials. Aside from fewer resources, however, high-poverty schools are often filled with vermin and antiquated classroom and recreational areas (Carroll et al., 2004). The National Commission on Teaching and American's Future carried out a survey of 3,336 teachers in high-poverty schools (Carroll et al., 2004). Of the total sample of teachers, 51% of New York, 47% of California, and 39% of Wisconsin state teachers reported inadequate physical facilities. In New York specifically, 26% of high-poverty school teachers versus 7% of low-poverty teachers reported unclean, closed, or inoperative bathroom facilities. Along with inadequate facilities, high-poverty teachers across the three states reported fewer instructional materials (e.g., textbooks) as well as limited access to and availability of computers and technology (Carroll et al., 2004). Lack of satisfactory facilities and the unavailability of academic resources typically stem from insufficient funding allocated to high-poverty schools. A review of the literature suggests that financial provisions are essential in increasing the educational quality of students in both low-and high-poverty schools (Carey, 2004). Yet, according to Carey (2004), the highest poverty school districts in more than half of the states across the U.S. receive fewer resources and

financial support, which inevitably lowers the educational quality received by the students at these institutions.

Parental Involvement. Parental contribution to educational quality includes, but is not limited to, participation with homework and school-related activities. Research examining parental involvement has reported both positive and negative correlations with educational quality (Astone & McLanahan, 1991; Cotton & Wikeland, 1989; Epstein, 1987; Fehrmann, Keith, & Reimers, 1987). For example, Sui-Chi and Willms (1996) sampled 24,599 eighth-grade students across the U.S. and found a positive relationship between parental involvement in school-related activities (e.g., Parent Teacher Association) and high academic achievement (a measure of educational quality). Parental involvement has also been linked to race/ethnicity. Griffith (1998) reported that lower parental participation in school-related activities was associated with being of Hispanic, African-American, or Asian-American background. On the other hand, Sui-Chi and Willms (1996) argued that parental involvement is a complicated concept consisting of a multitude of variables (e.g., parent-child discussion related to school and parent-school communication), which should be independently studied. Moreover, they reported that the association between parental involvement and QEd was influenced by the highest level of education earned by the parents.

Parental Education. Children born to highly educated parents tend to perform better, academically, than those with less educated parents (Magnuson, 2003). Higher education provides the opportunity for greater parental employment earnings and greater overall family income (Card, 1999; Duncan & Magnuson, 2005). Researchers examining the effect of family income on student educational quality have yet to demonstrate a

definitive relationship between the two variables. Duncan and Magnuson (2005), however, demonstrated that as family income increases, so does the academic achievement of children living in welfare-recipient households. The correlation between family income and achievement could imply that the greater the family earning, the better the opportunity for children to attend better schools and be equipped with proper academic materials (e.g., notebooks and pencils). The opportunity to attend better schools with proper resources and materials also implies greater QEd obtained by the student.

Motivation for achievement

The current study proposes motivation for achievement as the underlying mechanism involved in QEd. Motivation for achievement, consisting of attitude, drive, and ability to strategize, has been found to impact achievement (Bandura, 1977; 1997; Kirsch, 1982; Maddox, Norton, & Stoltenberg, 1986; Pintrich & Schrauben, 1992; Schunk, 1989; Zimmerman, 1998), which is negatively correlated with risk behaviors, including those relevant to contraction of HIV/AIDS in adolescents (e.g., unprotected sexual intercourse; Brooks, Balka, Abernathy, & Hamburg, 1994). In this study, the values obtained on the QEd measure will depend on level of motivation. The following highlights the importance of motivation in an academic setting and in the measurement of QEd.

Attitude. Self-efficacy, the ability to judge oneself in order to successfully perform a task, is often used to describe the role of attitude in achievement (Bandura, 1977). Specifically, levels of self-efficacy influence motivation for success. Schunk (1989), for example, showed that self-efficacy was a significant predictor of academic

performance regardless of intellectual ability. In other words, children with similar degrees of intellectual capabilities differed in academic performance as a function of level of self-efficacy, such that the higher the level of self-efficacy, the greater the academic performance.

Efficacy beliefs not only predict level of motivation for successful academic outcome, but also impact behavior (Bandura, 1997). In other words, if an individual does not believe that he or she has the capacity to achieve or perform well academically, he/she will not put forth the effort to achieve and will therefore risk not performing to his or her best ability. This idea has been demonstrated in studies examining perceived self-efficacy and academic performance (Bouffard-Bouchard, 2001; Collins, 1984; Schunk, 1984). Schunk (1984), for example showed that heightened perceptions of self-efficacy were accompanied by a positive increase in performance and one's judgment of self-efficacy was positively correlated with his or her demonstrated skills.

The relationship between self-efficacy and academic performance is likely to extend to neuropsychological test performance. If an individual was raised to have heightened self-efficacy, his or her perceptive ability, as well as drive to succeed, may, in fact, correlate with *how well* he or she performs in school and on cognitive test measures.

<u>Drive.</u> Attitude towards achievement, however, is not sufficient to account for motivation to achieve. Kirsch (1982) and Maddux et al. (1986) argue that outcome values or drives, whether enhanced by intrinsic or extrinsic variables, influence behavior and motivation to achieve. Incentive theories of motivation suggest that if an outcome is desirable, people will be motivated to behave in a way so as to achieve the outcome (Overmier & Lawry, 1979). This outcome value, however, is dependent on self-efficacy

beliefs (Maddux, Norton, & Stoltenberg, 1986). For example, if an individual does not believe he/she is capable of acquiring a desired end result, he/she will not engage in behaviors or exhibit the drive to achieve that result. It can be then inferred that, if an individual does not see value in doing well on tests or in an academic setting, he/she will not. This belief can be extended to include performance on neuropsychological tests. Most neuropsychological research provides monetary compensation for participation. The value of this extrinsic variable may or may not be enough for an individual to provide his or her best effort towards performance and may, in fact, lead to a diagnosis of cognitive impairment when impairment is not present. Nonetheless, it is important to assess an individual's drive, especially when it concerns the level of effort put forth to gain a measurement of performance. As such, an individual's drive to succeed as an adolescent can foreshadow his or her drive to succeed in similar situations in adulthood.

Strategy. Similarly, connections between strategies (e.g., self-evaluation, self monitoring, and self-reacting) and performance have been reported (Zimmerman, 1998). Aside from believing in one's abilities and having the drive or desire to reach an end goal, having the capability to execute specific strategies associated with the end goal is essential. A relationship between strategy and academic achievement has been reviewed in the literature (Schunk, 1989; Schunk & Zimmerman, 1998a, 1998b; Zimmerman, 1989; 1990), such that strategy has been shown to affect level of performance (Tuckman, 1990). Beyond believing in one's abilities and having the drive to reach an end goal, being able to plan efficiently and carry out specific strategies associated with those end goals are essential elements (Zimmerman, 1998). The current study will examine the impact of

motivation for achievement (consisting of the ability to develop and implement strategies) on QEd and neuropsychological test performance.

Attitude, drive, and strategy implementation are intercorrelated mechanisms of motivation to achieve. Without attitude towards achievement or a belief that one is capable of gaining success, the drive to engage in strategies to propel one to action will not be present. Without strategies, there is nothing to aid in guiding the required actions for success or achievement. This path can be evidenced in an academic setting. If a student does not receive guidance and support so that self-efficacy is strengthened, he/she may not exhibit the desire or drive to achieve and therefore, may not have strategies set in place to reach a successful outcome. For example, if a student does not believe that he can do well on tests and does not have support or encouragement from teachers and/or family, he is not as likely to dedicate time and effort to studying and he runs the risk of not achieving a sufficient test score.

It is important to note that all three components of academic motivation (i.e., attitude, drive, and strategy) rely on the availability of proper resources (e.g., textbooks), facilities, and instruction. If proper resources are available, students are more likely to learn and have both intrinsic and extrinsic motivation, as well as employ strategies to perform well in school. This motivation for achievement can then be extended to achievement in performance testing, which, in the current study, is the main outcome variable. The proposed study will examine the impact of motivation for achievement as it relates to quality of high school education and neuropsychological test performance.

Purpose and Significance of the Current Study

The examination of the influence of educational quality is essential in the assessment of neuropsychological performance in a low literacy, inner city, HIV/AIDS population. Teacher/student ratio, standardized testing, parental involvement, parental education, teacher quality, the condition of school facilities, self-efficacy, and literacy, have been independently examined in the assessment of QEd in schools and in research settings across the nation, but never in a single instrument. Reading level/literacy has been shown to attenuate racial/ethnic differences in neuropsychological performance. However, while reading level may be a useful variable in the assessment of cognitive impairment of ethnic minorities, it does not account for the differences in educational experiences and academic resources that may differ between racial/ethnic minorities (African-Americans and Hispanics) and Caucasian individuals. Additionally, the individual indicators of QEd previously mentioned have not been collectively used to assess this construct comprehensively.

The current study has two main goals: (1) examine the amount of variance in neuropsychological test scores accounted for by a novel, comprehensive measure of QEd alone in an HIV/AIDS population, and (2) determine whether scores on a QEd measure account for more variance than reading level/literacy. In this study, a self-report quality of education interview, containing questions related to the aforementioned indicators of QEd, will be developed and utilized to determine if discrepancies in QEd are related to neuropsychological test scores.

Prior research has indicated that QEd is a useful variable in the assessment and diagnosis of cognitive impairment in ethnic/racial minorities. Neuropsychological research, however, has only measured QEd in a one-dimensional form, reading level. The proposed study is unique to the current literature regarding the influence of quality of education on neuropsychological performance. As well, the measure of QEd used in this study considers social, economic, and motivational components of the educational experience, not just literacy level. Questions on attitude, drive, and strategy, as well as proper resources, facilities, support, guidance, and social engagements, were implemented in the self-report evaluation of quality of education in order to obtain an accurate account of an individual's educational experience. A novel survey instrument was developed to assess the impact of QEd on the neuropsychological assessment of cognitive dysfunction in an HIV^+ inner city cohort. The self-report questionnaire implemented in this study, administered in interview style, is a subjective measure of QEd. To counterbalance this subjectivity, participant's high school transcripts, an objective measure of performance, will be obtained and used in the data analyses. Specifically, the grade point average (GPA), obtained from the transcript, will be used to examine its relationship with QEd.

The development of a comprehensive method of assessing QEd is critical to the diagnosis of cognitive impairment in an HIV^+ population, especially an inner city, HIV^+ racial/ethnic minority sample who evidences a greater rate of chronic burden and depression and decreased access to healthcare compared to Caucasians. Proper assessment of cognitive impairment may lessen the discrepancy in neuropsychological

test performance reported between racial/ethnic minorities and Caucasians and decrease the potential for inaccurate diagnosis of cognitive impairment.

Hypotheses

The following hypotheses will be tested.

Primary Hypotheses

Hypothesis 1: Quality of education, as measured by raw scores on the QEd scale, will be a significant predictor of neuropsychological test performance in the domains of learning, attention/working memory, abstract/executive function, and information processing speed.

a. Quality of education will account for greater variance in neuropsychological test scores than will number of years of education.
b. Quality of education, measured by scores on the QEd scale, will account for greater variance in neuropsychological test performance than reading level/literacy, as measured by the WRAT-3.

Prior research has shown that self-reported years of education is not synonymous with quality of education and is discrepant with reading level. This hypothesis will examine whether this finding is replicated in an HIV population. In addition, quality of education will be examined using scores from the QEd scale.

Hypothesis 2: Ethnic/racial minorities will obtain significantly lower neuropsychological scores than Caucasians.

This hypothesis seeks to replicate previous findings that report lower performance for ethnic minorities as compared to their Caucasian counterparts on tests of learning, abstract/executive functions, attention/working memory, and speed of information processing.

Hypothesis 3. The total QEd and WRAT-3 reading score will be significantly more correlated with each other than will total QEd and number of years of education.

This hypothesis will analyze the relationship between QEd, WRAT-3, and number of years of education. QEd is predicted to be more significantly correlated with the WRAT-3 than with number of years of education.

Hypothesis 4. Results from the Motivation for achievement subscale will be a significant predictor of total QEd.

Previous research has shown a relationship between motivation for achievement and academic achievement (Bandura, 1977; 1997; Kirsch, 1982; Maddox, Norton, & Stoltenberg, 1986; Pintrich & Schrauben, 1992; Schunk, 1989; Zimmerman, 1998). This hypothesis will examine the relationship between motivation for achievement and achievement, per se, as measured by scores on a comprehensive quality of education scale in an adult HIV/AIDS population.

Exploratory hypotheses

Hypothesis 5. GPA will demonstrate a significant and positive correlation with self-reported academic performance.

This hypothesis will examine a correlation between self-reported school performance and GPA from high school transcripts, an objective measure of school performance. Results from question 45 of the QEd scale, “What were your grades like in high school?” will be used to analyze the relationship between self-reported academic performance and earned GPA, as verified through high school transcripts.

Hypothesis 6. Overall GPA, obtained from the high school transcript, will be positively correlated with total QEd.

The QEd scale incorporates multiple factors (e.g., student/teacher ratio and standardized testing) associated with several components of achievement and educational quality reviewed in the literature. This hypothesis will examine the relationship between total QEd score and achievement level, as measured by high school GPA.

Hypothesis 7. Scores on the Parent/Guardian Education and Involvement subscale will be more positively related to tests of executive functioning and verbal fluency than to measures of other cognitive domains.

This hypothesis examines the strength of the relationship between scores on the Parent/Guardian Education and Involvement subscale of the QEd scale with all cognitive domains. Measures of executive functioning have been significantly correlated with parents' educational level (Magnuson, 2003). In addition, parental education was found to predict higher scores in verbal fluency in children. Therefore, scores from the parental education and involvement subscale are expected to be more correlated with scores on the executive functioning and verbal fluency domains than with scores on tests of other cognitive domains.

Hypothesis 8. The Attendance & Performance subscale will be a significant predictor of performance on tests of learning and attention/working memory versus all other cognitive domains.

The Attendance & Performance subscale assesses attendance in high school as well as self-reported overall high school academic performance. This hypothesis will explore the relationship between Attendance & Performance and scores on the domains of learning and attention/working memory. This section assumes that students' presence in class and academic performance prospectively impacts their ability to learn

information after multiple exposures and to simultaneously attend to multiple stimuli. Attendance & Performance scores are predicted to be more significantly related to the learning and attention/working memory cognitive domains than to the other domains of cognitive functioning.

Hypothesis 9. Being employed during high school will be associated with a lower GPA.

This hypothesis will explore whether working during high school is negatively related to overall high school achievement, as measured by GPA.

Method

Research Design

A cross-sectional design was used to examine the impact of quality of education (QEd), compared to literacy level, on the neuropsychological performance of an HIV$^+$ cohort. The impact of two predictors, QEd and WRAT-3 reading score, on neuropsychological performance were examined.

Participants

Overview. The current study utilized data from two larger projects funded by the National Institute of Mental Health (i.e., Manhattan HIV Brain Bank [MHBB] and CNS HIV Anti-Retroviral Therapy Effects Research [CHARTER]), conducted by Susan Morgello, M.D., Principal Investigator. Fifty individuals served as participants. The G-Power statistical program was utilized to calculate power for this study (Buchner, Faul, & Erdfelder, 1997).

According to the power analysis, .80 power was needed to detect a large effect size of .35 at the .05 level with 31 participants. An additional 20 participants were recruited to strengthen the power of the sample and provide more meaningful results. Because the reading level of one participant was not obtained, this participant's data were excluded in the analyses for this study, yielding a sample size of 50.

Participants were approached to participate in this study during their follow-up visits to the Manhattan HIV Brain Bank (MHBB) and/or CHARTER, two longitudinal observational studies of the neurological, neuropsychological, and psychiatric functions of HIV-infected individuals. Participants were native English speakers or fluent in English. MHBB participation eligibility criteria include (a) presence of a condition

(progressive multifocal leukoencephalopathy, systemic or CNS lymphoma, disseminated mycobacterium avium- intracellulare, wasting (>30% lean body mass), AIDS Dementia Complex, CMV end organ disease, visceral Kaposi's sarcoma, congestive heart failure, hemoglobin less than 10 mg/dl, or serum albumin <3.2 g/dl) indicative of advanced HIV without effective therapy; (b) a CD4 count $\leq$ 50 cells/mm^3 for at least a 3-month period of time; or (c) judgment of substantive risk for imminent mortality by the participant's primary physician. CHARTER participation eligibility criteria include (a) seropositive HIV status and (b) HIV infection with or without antiretroviral medication.

Inclusion Criteria. Data from all existing MHBB and CHARTER participants were reviewed for inclusion by the primary investigator. Participants were selected for potential participation if they classified themselves as African-American, Hispanic, or Caucasian, completed the WRAT-3 at their entry visit, born in the U.S., native English speakers or fluent in English, attended at least one year of high school in New York State and were not missing more than two neuropsychological tests from each cognitive domain. Participants were approached to participate in this study prior to or during their biannual or annual MHBB and/or CHARTER follow-up visit. A screening tool (see Appendix C) was administered to examine whether each participant met criteria for inclusion in the current study. Participants were excluded if they had not attended high school in New York or if they had dyslexia or any another condition (e.g., blindness) that prevented or confounded reading. Participants were also required to provide written informed consent to participate as well as to obtain their high school transcript. If the participant attended more than one high school, the transcript from the last high school

they attended was obtained. Participants were compensated $10 for the completion of the study.

Procedures

Instruments

Neuropsychological Battery**.** Retrospective data from a battery of neuropsychological measures, developed by the National NeuroAIDS Tissue Consortium, sensitive to cognitive functioning in HIV, was used as a measure of neuropsychological functioning (Woods et al., 2004). The battery consisted of seven different cognitive domains sensitive to HIV impairment: motor, speed of information processing, attention/working memory, learning, memory, verbal fluency, and abstract/executive functioning (Woods et al., 2004). These domains are of interest in HIV because they are associated with the areas of the brain most commonly affected by HIV (i.e., basal ganglia, frontal lobes, and hippocampus). Table 1 summarizes the battery according to their cognitive domains. The neuropsychological battery consisted of the following measures: Grooved Pegboard Dominant hand (GPDH) and Non-dominant hand (GPNDH; Heaton, Grant & Matthews, 1991), WAIS-III: Digit Symbol Coding (DSC), Symbol Search (SS), and Letter Number Sequencing (LNS; Heaton, Taylor & Manly, 2001; The Psychological Corporation, 1997), Trail Making Test-Parts A (TMT-A) and B (TMT-B; Heaton, Grant & Matthews, 1991), Paced Auditory Serial Attention Test (PASAT; Diehr et al., 2003), Controlled Oral Word Association Test (F-A-S; Gladsjo et al., 1999), Hopkins Verbal Learning Test (HVLT; Benedict, Schretlen, Groninger, & Brandt, 1998), Brief Visuospatial Memory Test-Revised (BVMT-R; Benedict, 1997), and the Wisconsin Card Sorting Test-64 card version (WCST-64; Kongs, Thompson, Iverson, & Heaton, 2000).

The Reading subtest of the Wide Range Achievement Test-3 (WRAT-3; Wilkinson, 1993) was administered as a premorbid estimate of verbal intelligence and was used in the present study as a measure of literacy.

Table 1. Cognitive domains and neuropsychological measures

Domain	**Tests**
Motor	Grooved Pegboard - Dominant hand (GPDH) and Non-dominant hand (GPNDH)
Speed of Information Processing	Trail Making Test A (TMT-A) Digit Symbol Coding (DSC) Symbol Search (SS)
Attention/Working Memory	Letter Number Sequencing (LNS) PASAT
Learning	Hopkins Verbal Learning Test, Total Recall(HVLT) Benton Visual Memory Test, Total Recall (BVMT)
Memory	Hopkins Verbal Learning Test, Delayed Recall (HVLT) Benton Visual Memory Test, Delayed Recall (BVMT)
Verbal Fluency	Controlled Oral Word Association Test (COWAT/FAS)
Executive Functioning	Wisconsin Card Sorting Test-64 (WCST-64) (Perseverative responses, total errors, conceptual level) Trail Making Test-B (TMT-B)
Reading	Wide Range Achievement Test-3

Motor Domain

Grooved Pegboard (Dominant Hand and Non-Dominant Hand). The Grooved Pegboard test (Klove, 1983) has consistently been used to measure motor performance and dexterity in an HIV/AIDS population (Heaton et al., 2004; Rippeth et al., 2004; Stern

et al., 2001). This test involved the manipulation of pegs so that each is placed into a hole on a pegboard. The correct placement of the pegs is contingent on the correct rotation of the peg itself so that it fits into the hole. Each participant was required to use his or her dominant hand for the first trial and non-dominant hand for the second trail. Each trial was timed. The timed score served as the raw score. Test-retest reliability for this test is .82 (Lezak, 1995).

Speed of information processing

Trail Making Test (Part A; TMT-A). The Trail Making Test (Part A; Army Individual Test Battery, 1944) required participants to connect circles consisting of numbers from 1 to 25 in a consecutive manner from least to greatest while being timed. The completed time served as the raw score. This test has been reported to be an adequate measure of information processing speed within an HIV/AIDS population due to the speed with which the numbered circles can be correctly connected interspersed with planning and visual scanning skills (Carey et al., 2004; Rippeth et al., 2004). Additionally, the TMT-A is sensitive to the different stages of cognitive impairment in HIV (Spreen & Strauss, 1998). Test-retest reliability for this test ranges from approximately .60 to .78 (Lezak, 1995).

Digit Symbol Coding. The Wechsler Adult Intelligence Scale - Third Edition (WAIS-III) Digit Symbol Coding subtest (Wechsler, 1997) required the participant to fill in matching symbols that correspond to a given target within a 120-second time limit. The raw score is the correct number of symbols placed within the time limit. A maximum score of 133 is possible on this test. Digit Symbol Coding has been repeatedly used with

HIV populations as a measure of information processing (Grassi, Perin, & Borella, 1999; Stern et al., 2001; Heaton et al., 2004; Rippeth, et al., 2004) and its test-retest reliability coefficients range from .83 to .89, for ages 30 to 74 (The Psychological Corporation, 1997).

Symbol Search. The Wechsler Adult Intelligence Scale - Third Edition (WAIS-III) Symbol Search subtest (Wechsler, 1997) required a participant to match a shape from two separate groups of figures. For this test, if there was a match, the participant was told to mark the "yes" box. If not, the "no" box should be marked. Each participant was given a 120-second time limit to complete as many trials as possible. The number of correct items minus the number of incorrect items served as the raw score. This test has been repeatedly used in the assessment of speed of information processing in HIV-positive populations (Woods et al., 2006). Test-retest reliability for the Symbol Search subtest of the WAIS-III ranges from .79 to .82 for ages 30 to 74 (The Psychological Corporation, 1997).

Attention/Working memory

Letter Number Sequencing (LNS). In the administration of the Letter Number Sequencing subtest of the WAIS-III (Wechsler, 1997), the examiner read a string of numbers and letters. The participant was required to repeat the numbers and letters, numbers first, in numerical order, then letters in alphabetical order. This test consisted of 7 items with three trials per item whose string of numbers and letters increase in length for each succeeding item. Administration was discontinued after a participant failed all three trials of an item. There is no time limit on this test. The number of correct trials

served as the raw score. Scores range from 0 to 21. LNS has repeatedly been utilized as a measure of attention and working memory in HIV-positive populations (Woods et al., 2006). Test retest reliability for this test ranges from .78 to .80 for ages 30 to 74 (Wechsler, 1997).

The Paced Auditory Serial Addition Test (PASAT). This test (Gronwall, 1977; Gronwall & Sampson, 1974) required participants to mentally sum numbers from 1 to 9. The numbers were supplied by a voice on a tape recording. Participants were asked to add the first number that they heard to the second number that they heard and to say the sum aloud. Then, they added the second number that they heard to the third number that they heard, and so on, while they continued to say that sum aloud. This test was not timed and consisted of 50 trials with the correct number of trials serving as the raw score. This measure has been indicated to have one of the highest accuracy rates of cognitive impairment within an HIV-positive population (Heaton, et al., 1996). The test-retest reliability is reported as .90 for the PASAT (Spreen & Strauss, 1998).

Learning

Hopkins Verbal Learning Test (HVLT). During the administration of this test (Benedict, Schretlen, Groninger & Brandt, 1998), the examiner stated a list of 12 words aloud. The participant was then asked to repeat as many of the words as he or she remembered, in any order. This test consisted of three trials and the collective score from the three trials was used to assess verbal learning performance.

Benton Visual Memory Test (BVMT). For this test (Benedict, 1997), the participant was shown a display of 6 figures for 10 seconds. The display was then taken

away and the participant was asked to draw as many of the figures as he/she could remember in the correct location on the page. This was repeated for three trials with a maximum score of 12 per trial. The raw score was determined from the combined scores of accuracy and correct placement for each figure, across all three trials.

Memory

Hopkins Verbal Learning Test (HVLT) - Delayed Recall. The delayed recall of the HVLT occurs 20 minutes following the completion of trial 3 of the HVLT. Participants were asked to recall as many of the words previously repeated to them in any order. The raw score was derived from the number of word recalled. Maximum score is 12.

Benton Visual Memory Test (BVMT) - Delayed Recall. This test is a continuation of the BVMT previously described. It occurs 25 minutes following the completion of trial 3 of the immediate recall portion of the BVMT mentioned above. Visuospatial memory performance is determined after asking the participant to draw as many of the figures displayed numerous times. The raw score was determined from the summary of accuracy and correct placement for each figure recalled. Maximum score is 12.

Verbal fluency

Controlled Oral Word Association Test (COWAT, F-A-S). For this test (Benton, Hamsher, & Sivan, 1994) participants were given sixty seconds to list as many words as possible that began with the letters F, A, and S, one letter at a time. Participants were instructed not to include proper nouns or the same word with different endings. The

COWAT has continually been used to assess verbal fluency in HIV-positive populations (Butters et al., 1990; Heaton Grant, Butters, 1995; Woods et al., 2006). Raw scores were based on the number of words collectively stated for the letters F, A, and S.

Executive functioning

Wisconsin Card Sorting Test 64-card sorting version (WCST-64). In this test, participants were asked to match each of 64 cards in a deck to one of four key cards placed in front of them. There were three categories to which the participant could match the cards. To complete a category, 10 consecutive responses were required. Participants were told whether the placement of each card was right or wrong without being told how to match the cards. There was no time limit on this test. The test was completed when all the cards in the deck were matched. Number of perseverative responses served as the raw score. The WCST-64 assesses an individuals' ability to plan, organize, and shift sets. It is commonly utilized to assess abstract thinking and executive functioning in HIV-positive populations (Butters et al., 1990; Heaton Grant, Butters, 1995; Woods et al., 2006).

Trail Making Test (Part B). This test required participants to connect circles consisting of numbers and letters. The participant was asked to begin with the circle numbered 1 and connect it to the lettered circle, A, which then connects to a numbered circle 2. This sequence continued, number first then letter, in increasing consecutive and alphabetical order, until the participant reached number 13. This is a timed test and the completed time served as the raw score. This test assesses an individual's additive ability to plan, organize and scan the items on a page. It has routinely been used to assess

executive functioning in an HIV-positive population (Butters et al., 1990; Heaton Grant, Butters, 1995; Woods et al., 2006). Test-retest reliability coefficients for this test vary around .60 (Lezak, 1995).

Reading

Wide Range Achievement Test-3rd Edition (WRAT-3), Reading subtest. The Reading subset of the WRAT-3 has been used to assess premorbid functioning in neurologically healthy, neurologically impaired, and HIV-positive populations (Johnstone, Hexum, & Ashkanazi, 1995; Manly et al., 2002; O'Bryant, Schrimsher, and O'Jile, 2005; Ryan et al., 2005). During the administration of the Reading subtest of the WRAT-3, participants were asked to pronounce a series of words from a display that increased in phonological complexity. If a participant was unable to correctly pronounce 10 consecutive words, he/she was asked to pronounce letters of the alphabet from the display provided. Raw scores are based on the number of words and letters correctly pronounced. A maximum of 57 points can be earned and there is no time limit for this test. Grade based scores can also be derived using age-based normative values.

Quality of Education (QEd) Scale. The Baird Quality of Education Scale was used to assess the quality of education received in high school. The primary investigator of the current study was the author of this scale, which has yet to be statistically validated. This self-report questionnaire, administered in an interview style, consists of 66 items comprising 9 subsections evaluating the types of classes offered, perception of teachers, student/teacher relationship, testing, facility, attendance and performance, parental involvement and education, extracurricular activities, employment, and the participant's overall perception of the quality of his/her high school education. Motivation for

Achievement, a component of the scale, is not accounted for in the total QEd score, but is included in quantitative analysis of the data. Questions and answers were printed in an easy-to-read font size and style. All responses were pre-coded. The majority of items chosen for inclusion in the questionnaire were derived from findings in the literature used to assess educational quality. Other items were included for exploratory purposes. Two neuropsychologists (Desiree Byrd, Ph.D., and Elizabeth Ryan, Ph.D.) and one neuropathologist (Susan Morgello, M.D., the Principal Investigator of the MHBB at Mount Sinai School of Medicine) initially evaluated the items for the scale.

The objective was to develop a scale that was concise, easy to administer and score, and that would allow for the examination of factors reported in the general literature to reflect educational quality. With the exception of the Background and Employment subscales, used for exploratory purposes, scores from each subscale total to a maximum of 20 points. Scores from each subscale are then summed to form an overall value for QEd. The scale was oriented such that higher QEd scores reflect higher overall QEd.

A high QEd was conceptually defined as having proper academic accommodations for students with learning disabilities; a range of classes to enhance different learning styles; types of testing; strong academic performance; a perception of competent, dedicated, and prepared teachers; a small student/teacher ratio; a safe, drug-free, clean, and conducive-to-learning environment; adequate school attendance; strong parental/guardian involvement and concern in a student's academic performance; student participation in extracurricular activities; and employment and motivation for achievement. Total scores on the scale range from 14 to 180, with higher scores indicating a higher quality of education.

Background

Description. This is the initial subscale of the questionnaire.

Items. Questions 1 through 5 comprised this subscale, beginning with an open-ended question about a participant's high school, which offers the opportunity for the participant to speak candidly about his/her high school and offer information that may not be covered by the questions to follow. This section also inquired about the name(s) of a participant's high school, its location, time period in high school, and whether it was a public or private school. This section also inquired about reasons for changes in schools (if applicable), number of years of formal schooling, and whether a participant completed a high school education.

Scoring. Information in this section was purely qualitative and did not count towards the total QEd score.

Availability of Specialized Classes

Description. This subscale examined the types of learning assessments and placements available in high school. It also covered whether a participant repeated a grade in high school.

Items. Questions 6-12 comprise this section. Question 11 asks for the occupation or title of a person who may have told a participant that he/she has or had a learning disability. All other questions were formatted in a dichotomous manner, ("Yes/No") with an option to state, "Don't know."

Scoring. Questions 6-9 comprise this section and contained information most relevant to the aim of the section. Possible values in this section ranged from 2-15 points.

Questions were assigned nominal values such that increased available resources received the highest values.

Perception of Teachers

Description. This subscale contained questions 13-16. The aim of this section was to examine the participant's perceptions of his/her high school teacher's preparation and dedication to teaching, as well as his/her teacher's concern about him/her as a student. A general assessment of his/her high school teachers was also ascertained.

Items. The items in this subscale were formatted on a 5-point Likert scale where 1 reflected "not at all prepared, dedicated, etc." and 5 reflected "extremely prepared, dedicated, etc."

Scoring. All questions in this subscale counted towards the value for the subscale itself, as well as towards the overall quality of education score. Total score for this section ranged from 4-20 points.

Student/Teacher Ratio

Description. This subscale examined the nature of the interaction between teachers and students and required an overall estimate of the student to teacher ratio.

Items. Questions 17-20 comprise this subscale. All questions are formatted on a 5-point Likert scale of five choices with "5" representing the most valued response.

Scoring. All questions were included in the scoring for this section as well as in the overall QEd score. The total amount of points for this subscale ranged from 4 - 20.

Testing

Description. This subscale examined a participant's exposure to standardized testing throughout high school as well as their performance on tests during high school and their perception of the importance of doing well on tests.

Items. Items 21-27 comprised this section of the questionnaire. All questions in this section, with the exception of question 21, 23 and 24, were totaled and contributed to the overall QEd score. This section consists of multi-formatted items including open-ended, dichotomous and Likert scaled items, so that the maximum amount of information is retrieved. Items 21 and 24 were dichotomous items, 23 was an open ended question and the remainders use a Likert scale of 1-5 with 5 representing the most desired response.

Scoring. Only responses to questions 22 and 25-27 were used to calculate the total value for this section. These items are believed to capture the aim of the section.

Facility Condition

Description. This section addressed the conditions of recreational facilities, classrooms, and other facilities in the high school. Questions about the interior and exterior environments of a participants' high school were included to assess the impact of one's high school facility on QEd. Questions about safety and drug-free school environments were also included.

Items. Items 28-32 comprised this section. All items were formatted on a 4-point Likert scale with 1 reflecting "poor" and 4 reflecting "excellent." A "Don't know" response was also recorded.

Scoring. All questions were included in the subscale score, which ranged from 0 to 20 points.

Availability of Academic and Supplemental Resources

Description. The aim of this subscale was to examine the adequacy and availability of educational materials/resources, as well the conditions of recreational and classroom facilities in the high school. Questions about access to facilities such as activity rooms and a library were used to assess the availability of other ways of connecting to school and enhancing student socialization skills and learning.

Items. This subscale is composed of items 33-37. All questions are scaled from 1 to 4, with 1 representing "Did not have those rooms, classes, etc." and 4 representing "Good."

Scoring. All questions were included in this subscale's score. Scoring for this section ranged from 0 to 20.

Attendance & Performance

Description. This subscale examined a participant's attendance in high school as well as his/her overall high school academic performance. This section assumes that students are held accountable for some of their educational experiences through their attendance in school and performance in class. Student's reported academic performance will be measured against their overall GPA, obtained from high school transcripts.

Items. Questions 39-45 comprise this subscale. Only items 39, 41-43, and 45 are included in the total subscale score. These items use a scale of 4 choices.

Scoring. All items with the exception of 40 and 44 were included in the scoring for this subscale. Scores in this section range from 0-20. All other questions are included for exploratory purposes.

Parent/Guardian Education & Involvement

Description. The aim of this subscale was to examine the influence of parental/guardian education and involvement (e.g., concern with homework and report cards, attendance at parent/ teacher events) on QEd. The questions involved the number of occupants in the home, the level of education of the person who helped a participant with homework during their high school years, parental or guardian attendance at parent/teacher meetings, as well as the level of employment of the guardian. Questions in this section also examined whether a participants' guardian were employed and the nature of his/her employment.

Items. Items 46-54 comprised this section. Items 51-54 were quantitatively analyzed and 51-54, which inquire about parent/guardian employment, parent/guardian concern and involvement with schoolwork, attendance at parent/teacher events and parent/guardian employment.

Scoring. Scores for this subscale ranged from 0-20.

Extracurricular Activities

Description. Participation in physical education had been reported to influence healthy habits and lifestyle, as well as to promote connectivity to school and education. The aim of this section was to examine how active the participant was in extracurricular activity during high school. Questions relate to the nature of involvement in extracurricular activities and the length of that involvement.

Items. Item 55 and 56 comprised this section. Scaled questions were created to enable the most accurate information by providing several possible responses to questions.

Scoring. Responses for this subscale summed to a maximum of 20 points.

Employment During High School

Description. This section examined the impact of student employment on QEd. Questions on the type, length, and hours of employment throughout high school are asked, as well as the position(s) held and place of employment.

Items. This subscale consisted of items 57 and 58.

Scoring. Questions in this section were not counted toward the total QEd score. Responses were qualitatively examined.

Overall QEd

Description. The final subscale asked for a general assessment of educational quality as well as any other information related to educational quality that the participant could offer. The section concluded with a question about the accuracy with which the participant was able to recall events and topics associated with the QEd gained in high school.

Items. This subscale consisted of items 64-66.

Scoring. Only item 59, which assesses the overall perception of the QEd, was used for scoring is this section. The remainder of the items was qualitatively analyzed.

Motivation for Achievement

Description. This subscale precedes the last section of the questionnaire. Questions pertain to the level of self-efficacy, motivation, drive and strategy a participant encompassed during his/her high school years.

Items. This subscale consisted of items 60-63. Items were derived from the self-efficacy, valuing of subject, mastery orientation, planning and study management dimensions of The Student Motivation and Engagement Scale (Martin, 2001, 2003).

Level of self-efficacy, attitude/motivation to learn, drive, and use of strategies to succeed are important principles that enable self-development, enrichment, growth and self-esteem, also have a role in QEd (Bandura, 1977). The Student Motivation and Engagement Scale were originally designed to assess motivation and engagement of high school students. It has been shown to be reliable, have adequate construct validity, and is associated with student achievement (Martin, 2001; 2003).

Scoring. All items in this subscale were included in scoring. The maximum number of points for this section is 20.

Proposed Experimental Procedure

Overview. The proposed experimental procedures encompassed two main steps: (a) collection of pre-existing data from the neuropsychological battery and the WRAT-3; and (b) collection of data from the QEd questionnaire.

Neuropsychological data. Neuropsychological data from the initial research visit was used to examine the hypotheses. Initial data was used to avoid potential practice effects in neuropsychological performance. In addition, the majority of the WRAT-3 administrations were conducted at the initial visits. Participants were administered the neuropsychological battery of tests by trained psychometrists using standardized procedures. The battery took approximately 1.5-2 hours to administer. All data were double scored, and raw scores were converted to T-scores using the aforementioned published norms.

Reading/literacy level. To assess reading level, the Reading Recognition subtest of the WRAT-3 was administered. Participants were presented with a display consisting

of letters of the alphabet and words listed in order of increasing phonological difficulty. Raw scores were based on the number of correctly pronounced words and letters.

Quality of Education. The 30-60 minute QEd questionnaire was administered to participants in an interview style. Participants were required to sign informed consents to participate in the study as well as consent to obtain their high school transcripts. All data were manually entered and used to test the hypotheses.

Piloting

Overview. The QEd questionnaire was piloted to examine the length and ease of administration, as well as to examine inter-item reliability. All participants were drawn from the community and were known to the examiner. Piloting occurred in two phases. The first phase included five participants; all were HIV-negative, born in the U.S., native English-speakers, and had attended high school in the New York area. As a result of the first phase of piloting, changes were made to the questionnaire including rewording of questions to simplify them, follow-up questions were added to increase the comprehensiveness of the data, and longer sections were divided to differentiate individual topics. Table 2 summarizes the demographic information of the participants from phase one of piloting, including gender, age, and ethnicity.

Table 2. Pilot Demographics - Phase 1

Participant	Gender	Age	Race/Ethnicity
1	Female	51	African-American
2	Male	26	African-American
3	Female	29	Caucasian
4	Female	36	African-American
5	Male	34	Hispanic

The second phase included a revised questionnaire and was carried out with five participants (see Table 3). Only the QEd was administered. As a result of this phase of piloting, questions were again reworded and coding was revised. Table 3 summarizes demographic information of the participants from phase two, including age, gender, and ethnicity. Pilot participants did not report any distress or misunderstanding of any questions asked during the interview.

Table 3. Pilot Demographics – Phase 2

Participant	Gender	Age	Race/Ethnicity
1	Male	30	African-American
2	Male	59	Caucasian
3	Female	62	Caucasian
4	Male	27	African-American
5	Male	36	Hispanic

Reliability results. Since the Baird Quality of Education questionnaire includes responses that are dichotomized and scaled, Cronbach's analyses of reliability were used. Cronbach's reliability provides coefficients for both dichotomized and/or multiple scaled questionnaires. Alpha coefficients range from 0.00 to 1.00, with 0.70 being a generally acceptable reliability coefficient (Nunnaly, 1978). Reliability results for the second phase of piloting were better than the first. Prior to the second phase of piloting, changes in question structure and item scaling were performed to ensure proper construct validity and increase inter-item reliability. Table 4 summarizes the alpha coefficients for each pilot phase. Reliability (Cronbach's α) for each of the subscales within the questionnaire increased after the second phase of piloting, with the exception of the Availability of Specialized Classes ($\alpha = 0.00$) and Condition of Facility ($\alpha = 0.92$). The wide range of scores as well as the small sample size used in the piloting may explain the low value for

the Availability of Specialized Classes after the second phase of piloting. While the reliability for the Condition of Facility subscale decreased following the 2nd phase of piloting (from 0.946 to 0.916), the alpha coefficient is still a generally acceptable value. The low values during phase 1 of piloting for the Attendance and Performance and Parent/Guardian Education and Involvement subscales were attributed to the small size of the sample (N = 5) and the variability in responses to questions within a given subscale. The negative value from phase 1 piloting for the Student/Teacher Ratio subscale was attributed to inverse coding responses. This was changed prior to the second piloting phase which showed a good reliability coefficient for this subscale. Two of the sections, extracurricular activity and overall quality of education, were not included in the Cronbach's alpha analyses because these sections were comprised of only one question.

Following the second phase of piloting, all questions counted toward the score for each subscale were arranged on a Likert scale and each subscale totaled a maximum of 20 points. An additional subscale, Motivation for Achievement was added to assess the attitude, drive, and a participant's ability to strategize throughout his or her high school years. This subscale also consists of questions formatted on a Likert Scale and has a maximum of 20 points.

Table 4. Cronbach's alpha coefficients

Section	**1st piloting coefficients**	**2nd piloting coefficients**
Availability of Specialized Classes	0.889	0
Perception of Teachers	0.864	0.989
Student/teacher Ratio	-0.821	0.829
Testing	0.624	0.927

Facility Condition	0.946	0.916
Attendance & Performance	0.343	0.729
Parent/Guardian Education & Involvement	0.052	0.985

Data Analyses

The present study was designed to assess the impact of QEd and literacy on neuropsychological test performance in an HIV^+ sample. The sample will be characterized by means and standard deviations for all major demographic variables including age, education, ethnicity/race, and educational quality. The means, standard deviations, skewness, kurtosis, and linearity of neuropsychological test scores will be examined. Initially, we will conduct tests of linearity, independence of observations, homoscedasticity, and normality. All scores will be evaluated for non-normal distributions. Scores with significantly skewed distributions will be statistically transformed.

Primary Hypotheses

Hypothesis 1: Quality of education, as measured by raw scores on the QEd scale, will be a significant predictor of neuropsychological performance in the domains of learning, attention/working memory, abstract/executive function, and information processing speed.

a. Quality of education will account for greater variance in neuropsychological test scores than will number of years of education.
b. Quality of education, measured by scores on the QEd scale, will account for greater variance in neuropsychological test performance than reading level/literacy, as measured by the WRAT-3.

A stepwise multiple linear regression analysis will be used to analyze whether scores on QEd account for greater variance in neuropsychological test scores than do

number of years of education and/or reading level/literacy. Age and gender-adjusted neuropsychological T-scores will be used as the dependent variables in this analysis in order to avoid over correcting for education-adjusted neuropsychological scores. Age will be entered into the regression model at step one, with number of years of education, literacy, and quality of education added in succession. This procedure will allow statistical adjustment for the effects of education and educational quality as independent indicators of cognitive outcome and a determination of what educational quality adds to the prediction of cognitive test scores, over and above number of years of education and literacy.

In the regression model, education level and quality of education will be examined as continuous variables. Cohen (1983) and Aiken and West (1991) prefer this approach as it enables all of the information from predictor variables. In addition, it appears to be a more sensitive method for detecting significant effects when they do exist, particularly within a small sample.

Hypothesis 2: Ethnic minorities will earn significantly lower scores on the QEd scale than Caucasians.

A one-way between-subjects Analysis of Variance (ANOVA) with QEd as the dependent variable and race/ethnicity as the independent variable will be used to compare group performances on the QEd scale. Previous research has shown that reading level, an index of QEd, was lower in an HIV^+ minority group than in an HIV^+ Caucasian group (Ryan et al., 2005). This hypothesis will focus on whether the same is true for the measure of QEd used in this study.

Hypothesis 3. The total QEd and WRAT-3 reading score will be significantly more correlated to each other than will total QEd and number of years of education.

Pearson's product-moment correlation coefficients will be used to analyze the relationship between QEd, WRAT-3, and number of years of education. QEd is predicted to be more significantly correlated with the WRAT-3 than with number of years of education as WRAT-3 assesses the reading level of an individual, which has previously been shown to be an accurate measurement of QEd. The Fischer z transformation will be used to examine the significance of differences between correlation coefficients.

Hypothesis 4. QEd will be a significant predictor of Motivation for Achievement.

Motivation for Achievement, the independent variable, and total QEd, the dependent variable, will be entered into a linear regression analysis to examine whether QEd is a significant predictor of Motivation for Achievement. Both Motivation for Achievement and total QEd will be examined as continuous variables.

<u>Exploratory Hypotheses</u>

Hypothesis 5. GPA will demonstrate a significant and positive correlation with self-reported academic performance.

The relationship between self-reported high school performance and GPA will be examined using the Pearson correlation. Numerical GPAs, from students' high school transcripts, will be transformed into their respective letter grades and used in this analysis.

Hypothesis 6. Overall GPA, obtained from the high school transcript, will be positively correlated with total QEd score.

Pearson correlations will be used to examine the relationship between total scores on the QEd scale and the overall high school transcript GPA across all participants.

Hypothesis 7. Scores on the Parent/guardian education subscale will be more positively related to tests of executive functioning and verbal fluency than to measures of other cognitive domains.

Pearson's product-moment correlation coefficients will be used to determine the association between scores on the Parent/Guardian subscale of the QEd scale and the age adjusted T-scores from the different cognitive domains. Measures of executive functioning and verbal fluency, compared to other cognitive domains, are expected to be significantly (and more positively correlated) to scores on the Parent/Guardian Education and Involvement subscale of the QEd scale.

Hypothesis 8: The Attendance and Performance subscale will be a significant predictor of performance on tests of learning and attention/working memory versus all other cognitive domains.

A multiple regression analysis will be used to examine whether the subscale, Attendance and Performance, is a more significant predictor of performance on the cognitive domains of learning and attention/working memory domains, than on other cognitive domains. In this analysis, scores on the Attention & Performance subscale will serve as the independent variable and age adjusted neuropsychological T-scores for tests in each cognitive domain will serve as the dependent variable.

Hypothesis 9. Being employed during high school will be associated with a lower GPA.

Pearson correlations will be used to examine the relationship between high school employment status and GPA. Working during high school is predicted to be significantly correlated with lower GPA.

Results

Statistical Analyses

Data were collected for 50 participants in this study. The data were examined for skewness, kurtosis and normality. All scores were normally distributed. Statistical analyses were comprised of several major components. Initially, descriptive statistics were conducted to describe the data by racial/ethnic group, gender, and recruitment group. Correlations between age and the aforementioned variables were also examined. Post hoc procedures were applied to explore all significant main effects. Next, several analyses were conducted to investigate the internal consistency of the Baird Quality of Education Sale, followed by descriptive statistics for the scale. Finally, statistical analyses were conducted to examine any main effects of group on QEd. As previously mentioned, post hoc procedures were used to examine all significant main effects and correlation analysis was conducted to evaluate the relationship between age and QEd.

Total Sample Characteristics

Ethnicity. Several analyses were conducted to evaluate the relationship between ethnic group and age, gender, education level, reading level, and motivation for achievement scores (Table 5). The sample population consisted of 9 Caucasians, 25 African-Americans, and 16 Hispanics. Significant group differences were found for age, $F(2, 47) = 7.21$, $p < .001$; level of education, $F(2, 47) = 3.61$, $p = .04$; reading level, $F(2, 47) = 10.64$, $p < .001$; and motivation for achievement, $F(2, 47) = 4.93$, $p = .01$. Post-hoc comparisons revealed that African-American participants were significantly older than Hispanics in the sample and that Caucasians had significantly higher levels of education than Hispanics, as well as significantly higher reading levels than both African-American

and Hispanic participants. Analyses also revealed significantly higher levels of motivation for achievement for African-Americans than Hispanics.

Table 6 displays mean t-scores for each cognitive domain by ethnic group. Significant ethnic group differences in cognitive performance were found in the domains of attention/working memory, $F(2, 38) = 6.28$, $p = .004$; learning, $F(2, 47) = 3.4$, $p = .04$; verbal fluency, $F(2, 47) = 3.97$, $p =.03$; and executive functioning, $F(2, 46) = 3.46$, $p = .04$. Post-hoc comparisons revealed that Caucasians performed significantly better than both African-American and Hispanic participants on tests of attention/working memory, learning, and verbal fluency. In addition, in the domain of executive functioning, Caucasians scored higher than African-American participants.

Table 5. ***Age, gender, education level, reading level, and motivation for achievement by racial/ethnic group***

	Caucasian (n = 9)		**African-American (n = 25)**		**Hispanic (n = 16)**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Age	48.78	8.24	50.92*	6.17	43.63*	4.06
Education level	14.33*	3.35	12.52	2.29	11.69*	1.78
WRAT-3 Reading t-score	53.56*	10.85	37.48*	8.09	40.00*	9.45
Motivation for achievement	15.00	3.46	16.00*	3.19	12.31*	4.47

* Results are significant at the .05 level

Table 6. Cognitive domain T-score performance by ethnic group

Cognitive domain	Caucasian		African-American		Hispanic	
	Mean	SD	Mean	SD	Mean	SD
Motor	34.78	15.68	29.96	18.12	35.02	14.94
Speed of information processing	46.80	12.41	44.22	10.96	42.49	12.37
Attention/working memory	56.34*	5.83	49.07*	8.36	44.78	7.96
Learning	42.94*	11.12	34.44*	10.00	32.47	9.01
Memory	40.11	12.25	36.42	10.17	35.78	9.76
Verbal fluency	49.09*	14.15	37.44*	10.33	38.80	9.33
Executive functioning	43.01*	9.74	34.42*	8.73	38.58	7.91

* Results are significant at the .05 level

Gender. Several analyses were conducted to examine sex differences. Table 7 presents mean scores for reading level, years of education, and motivation for achievement by gender. Results from an independent samples t-test revealed a significant gender difference for education level, t(48) = 6.20, p = .02, only, with women completing slightly more education than men. There were no differences between males and females on reading level or motivation for achievement. Table 8 displays performance on cognitive domains by gender. Analyses revealed a significant gender difference on tests of motor, t(48) = 5.40, p = .02, and executive functioning, t(47) = 3.11, p = .003, with men performing better than women. Finally, results from an independent sample t-test revealed no significant difference between men and women on age, t(48) = 1.34, p = .19.

Table 7. Reading level, years of education and motivation for achievement by gender

	Male (n = 30)		Female (n = 20)	
	Mean	**SD**	**Mean**	**SD**
Reading level	42.73	11.59	38.85	8.93
Years of education	12.53*	2.81	12.65*	1.98
Motivation for achievement	13.97	3.70	15.65	4.25

* Results are significant at the .05 level

Table 8. Cognitive domain performance by gender

Cognitive domain	**Male**		**Female**	
	Mean	**SD**	**Mean**	**SD**
Motor	38.99*	16.60	22.64*	10.98
Speed of information processing	44.73	12.57	43.18	9.97
Attention/working memory	50.21	8.87	47.10	8.33
Learning	35.57	11.09	35.00	9.49
Memory	36.35	10.96	37.68	9.52
Verbal fluency	40.79	12.35	38.73	10.06
Executive functioning	40.32	8.22	32.68	8.59

* Results are significant at the .05 level

Recruitment group. Tables 9 and 10 display descriptive statistics for race/ethnicity, gender, age, education level, reading level, and motivation for achievement for the entire sample, by recruitment group. Several one-way ANOVAs were conducted to examine group differences across all variables. No significant group effects were found for any variable except for motivation for achievement, $F(1, 48) = 4.97$, $p = .03$. Participants recruited from the CHARTER group showed greater levels of

motivation for achievement than those from the MHBB group. Table 11 presents the results from a one-way ANOVA with recruitment group as the independent variable and scores on cognitive domains as the dependent variable. A significant group effect was found for the speed of information processing, $F(1, 47) = 6.61$, $p = .01$ and verbal fluency, $F(1, 48) = 5.39$, $p = .03$ domains, with participants from the CHARTER recruitment group showing greater performance than those from the MHBB group.

Table 9. Age, gender, race/ ethnicity, education level, reading level and quality of education by recruitment group

Group	n	Race/Ethnicity			Gender		Age	
		Caucasian	African-American	Hispanic	M	F	Mean	SD
MHBB	36	6	16	14	22	14	47.78	7.19
CHARTER	14	3	9	2	8	6	49.29	5.51

Table 10. Education level, reading level and motivation for achievement data by recruitment group

	Education level		Reading level		Motivation for achievement	
	Mean	SD	Mean	SD	Mean	SD
MHBB	12.39	2.52	40.36	10.80	13.89*	4.22
CHARTER	13.07	2.43	43.29	10.48	16.57*	2.44

* Results are significant at the .05 level

Table 11. Cognitive performance by recruitment group

Cognitive domain	MHBB		CHARTER	
	Mean	**SD**	**Mean**	**SD**
Motor	30.40	15.92	37.72	17.71
Speed of information processing	41.59*	10.58	50.47*	11.77
Attention/working memory	47.93	10.58	51.26	11.77
Learning	34.64	11.06	37.14	8.47
Memory	36.47	10.85	37.93	9.14
Verbal fluency	37.73*	10.67	45.73*	11.65
Executive functioning	37.68	10.04	36.45	5.95

* Results are significant at the .05 level

Age. A series of correlation analyses were conducted to examine the relationship between age and reading level, years of education, motivation for achievement, and cognitive performance. Table 12 displays the results for the correlation analyses for age and reading level, years of education, and motivation for achievement. The analyses revealed no significant relationship between age and any of the three study variables. Similarly, the correlation between age and cognitive performance was not significant for any of the seven cognitive domains (Table 13).

Table 12. Correlation between age and reading level, years of education and motivation for achievement

Variable		Age
Reading level	*r*	.14
	p	.33
	n	50
Years of education	*r*	.18
	p	.21
	n	50
Motivation for achievement	*r*	.24
	p	.10
	n	50

Table 13. Correlation between age and cognition

Cognitive domain		Age
Motor	*r*	-.002
	p	.10
	n	50
Speed of information processing	*r*	-.07
	p	.62
	n	49
Attention/working memory	*r*	.23
	p	.15
	n	41
Learning	*r*	.10
	p	.49
	n	50
Memory	*r*	-.02
	p	.89
	n	50
Verbal fluency	*r*	.06
	p	.71
	n	50
Executive functioning	*r*	.05
	p	.72
	n	49

Quality of education. The internal consistency of the Baird Quality of Education Scale was examined using Cronbach's alpha. The scale was administered to all 50

participants. Possible scores on the scale ranged from 14-180, with higher scores indicating greater quality of education. Cronbach's internal consistency analyses were conducted for the individual subscales within the questionnaire, with the exception of the overall QEd subscale, which consisted of only one item. The results of the analyses are presented in Table 14 for each of the nine subscales. The "n" values signify the number of items within each subscale. All subscales revealed good reliability with the exception of the Student/Teacher Ratio, Attendance and Performance, and Extracurricular activities subscales (Nunnaly, 1978). In addition, the results of Cronbach's analysis for the ten subscales revealed an adequate alpha value (i.e., .82), with a mean value for the whole scale of 126.12 (SD = 28.25).

Table 14. Descriptive statistics and Cronbach's Alpha Reliability Estimates

Subscale	Mean	SD	Cronbach's alpha
Availability of Specialized Classes (n=4)	11.78	5.50	.65
Perception of Teachers (n = 4)	14.08	3.87	.89
Student/Teacher Ratio (n = 4)	11.94	2.14	-.09
Testing (n = 4)	13.16	4.84	.81
Condition of Facility (n = 5)	13.98	3.85	.88
Availability of academic & supplementary resources (n = 5)	13.04	3.10	.67
Attendance & Performance (n = 5)	12.14	3.02	.30
Parent/Guardian Education & Involvement (n = 4)	15.80	3.65	.63
Extracurricular Activities (n = 4)	10.44	8.83	-.14

We analyzed the item-total statistics for the Student/Teacher Ratio, Attendance & Performance, and Extracurricular Activities subscales separately to examine how the items within each subscale were functioning together. Table 15 displays the items within the Student/Teacher Ratio subscale. The correlation matrix for the items in this scale was examined closely. Based on visual inspection of the item correlation matrix, items 17 and 18 appeared to have the highest correlation and therefore, were, maintained for the scale (Table 16). Items 17 and 18 showed an adequate itercorrelation estimate of .66 and appeared to function well together. The resulting alpha coefficient for the Student/Teacher Ratio subscale with only items 17 and 18 was .79. Items 19 and 20 were subsequently deleted from the scale and not accounted for in the succeeding analyses.

Table 15. Questions 17, 18, 19 and 20 from the Student/Teacher Ratio subscale

Item Number	Question
17	On average, please rate how well your high school teachers were able to maintain control of your classes
18	On average, please rate how well your high school teachers were able to engage or sustain the attention of students
19	What was the average size of most of your classes in high school
20	On a scale from one to five, how crowded would you say your typical class was

Table 16. Correlation matrix for the items in the Student/Teacher Ratio subscale

	Item 17	**Item 18**	**Item 19**	**Item 20**
Item 17	1.00			
Item 18	.66	1.00		
Item 19	- .11	-.12	1.00	
Item 20	- .23	.54	.22	1.00

Table 17 displays the items originally included for scoring within the Attendance & Performance subscale of the questionnaire. Similarly, for the Attendance & Performance subscale of the questionnaire, based on visual inspection, the correlation matrix statistics were more in favor of items 39, 42, and 45 for inclusion in the subscale than the original format of the subscale (Table 18). The resulting reliability coefficient for the Attendance & Performance subscale, with the exclusion of items 41 and 43, was .64. Scores for items 41 and 43 were subsequently deleted in the succeeding analyses.

Because the Extracurricular Activities subscale only consisted of two items, additional analyses were not conducted to examine the correlation between these two items. Scores for this subscale were subsequently excluded from the total sum score for QEd.

Table 19 presents the means and standard deviations for each subscale with the exception of the overall QEd subscale, contributing to the total QEd score utilized in subsequent analyses. The new alpha reliability coefficient for the entire scale, with the nine subscales was .84.

Table 17. Questions 39, 41, 42, 43 and 45 from the Attendance & Performance subscale

Item Number	Question
39	Approximately how many days or weeks did you miss in high school on average?
41	Were the truancy officers in your high school effective?
42	How well did you do in any honors classes you were in during high school?
43	How well did you do in any remedial classes you were in during high school?
45	What were your grades like in high school?

Table 18. Correlation matrix for items in the Attendance & Performance subscale

	Item 39	**Item 41**	**Item 42**	**Item 43**	**Item 45**
Item 39	1.00				
Item 41	.22	1.00			
Item 42	.31	-.07	1.00		
Item 43	-.42	.23	-.01	1.00	
Item 45	.20	.10	.53	.17	1.00

Table 19. Descriptive statistics and Cronbach's Alpha Reliability estimates for the revised QEd scale

Subscale	**Mean**	**SD**	**Cronbach's alpha**
Availability of Specialized Classes (n = 4)	11.78	5.50	.65
Perception of Teachers (n = 4)	14.08	3.87	.89
Student/Teacher Ratio (n = 2)	11.94	2.14	.79
Testing (n = 4)	13.16	4.84	.81
Condition of Facility (n = 5)	13.98	3.85	.88
Availability of academic & supplementary resources (n = 5)	13.04	3.10	.67
Attendance & Performance (n = 3)	12.14	3.02	.64
Parent/Guardian Education & Involvement (n = 4)	15.80	3.65	.63

The following statistical analyses utilized scores from the revised QEd scale. Descriptive statistics for the Baird Quality of Education scale are presented in Table 20. The mean total quality of education score was 114.7 with a range in scores from 50 to 167.

Table 20. Descriptive statistics for the total QEd scale

	n	**Mean**	**SD**	**Range**
Total QEd	50	104.26	23.34	50-147

Several analyses were conducted to examine whether any group effects existed in relation to quality of education, as measured by total QEd score. Results of a one-way ANOVA revealed that there were no significant differences by ethnic group, $F(2, 47) = .87$, $p = .43$. In addition, there were no significant differences by gender, $t(48) = .223$, $p = .83$, or recruitment group, $t(48) = -.95$, $p = .35$, (Table 21). In addition, results of Pearson's correlation analyses did not reveal a significant correlation between age and quality of education ($r = .09$, $p = .54$).

Table 21. QEd data by ethnicity, gender and recruitment group

	Race/Ethnicity			**Gender**		**Recruitment Group**	
QEd	**Caucasian**	**African-American**	**Hispanic**	**M**	**F**	**MHBB**	**CHARTER**
Mean	110.89	105.52	98.56	104.87	103.35	102.31	109.29
SD	22.84	24.74	21.42	23.75	23.30	24.81	18.96

Tables 22, 23, and 24 displays mean quality of education subscale scores by ethnicity, gender, and recruitment group, respectively. Statistical analyses did not reveal significant main effects of ethnicity for any of the QEd subscales. In addition, no main

gender effects were revealed for any of the QEd subscales. Lastly, Pearson's correlation analyses were conducted to examine the correlation between the total scores on the QEd scale and scores on each subscale. Results of the correlation analyses, presented in Table 25, showed that all correlations were statistically significant and were greater than .40. All subscale scores were significantly correlated with the total score on the scale, thereby contributing to the internal consistency of the entire instrument.

Table 22. QEd subscales by race/ ethnicity

Quality of Education Subscales	**Caucasian**		**African-American**		**Hispanic**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Classes	9.11	5.84	12.60	5.83	12.00	4.58
Perception of Teachers	15.44	3.36	13.92	3.94	13.56	4.08
Student/Teacher Ratio	6.67	2.45	6.56	1.96	5.94	2.02
Testing	15.33	4.53	13.28	4.58	11.75	5.21
Condition of Facility	16.22	3.87	13.72	4.03	13.13	3.24
Availability of Academic and Supplementary Resources	14.56	2.70	12.52	2.86	13.00	3.54
Attendance & Performance	5.56	4.33	6.28	3.16	6.50	2.31
Parental education & involvement	15.67	4.36	16.72	3.42	14.44	3.35
Overall QEd	12.33	5.39	9.92	6.01	8.25	5.56

Table 23. QEd subscales by gender

Quality of Education Subscales	Male		Female	
	Mean	SD	Mean	SD
Classes	11.90	5.49	11.60	5.67
Perception of Teachers	14.23	3.74	13.85	4.15
Student/Teacher Ratio	6.33	2.11	6.45	2.01
Testing	13.20	4.87	13.10	4.93
Condition of Facility	13.87	4.34	14.15	3.05
Resources	13.23	2.71	12.75	3.65
Attendance & Performance	7.10	3.04	4.90	2.79
Parental education & involvement	14.93	3.57	17.10	3.45
Overall QEd	10.07	5.13	9.45	6.86

Table 24. QEd subscales by recruitment group

Quality of Education Subscales	MHBB		CHARTER	
	Mean	SD	Mean	SD
Classes	11.14	5.13	13.43	6.26
Perception of Teachers	14.03	4.24	14.21	2.83
Student/Teacher Ratio	6.39	2.27	6.36	1.39
Testing	12.83	5.26	14.00	3.59
Condition of Facility	14.03	3.97	13.86	3.66
Resources	13.28	3.35	12.43	2.31
Attendance & Performance	6.31	3.12	6.00	3.21
Parental education & involvement	15.00	3.74	17.86	2.48
Overall QEd	9.31	5.95	11.14	5.46

Table 25. Pearson's correlations for Total QEd and individual subscales

Subscales	Total QEd (r)
Availability of Specialized Classes	.50**
Perception of Teachers	.77**
Student/Teacher Ratio	.77**
Testing	.77**
Condition of Facility	.75**
Availability of academic & supplementary resources	.63**
Attendance & Performance	.48**
Parent/Guardian Education & Involvement	.37**
Overall QEd	.80**

** Correlation is significant at the .01 level.

Hypothesis 1.

It was hypothesized that quality of education would be a significant predictor of neuropsychological performance in the domains of learning, attention/working memory, abstract/executive function, and information processing speed. Specifically, it was hypothesized that

(a) Quality of education (QEd) would account for greater variance in neuropsychological test scores than number of years of education, and

(b) Quality of education, measured by scores on the QEd scale, would account for greater variance in neuropsychological test performance than reading level/literacy, as measured by the WRAT-3.

Stepwise multiple linear regression analyses were conducted to analyze whether scores on the QEd scale would account for greater variance in neuropsychological scores than number of years of education and/or reading level/literacy. Individual neuropsychological test T-scores were averaged according to their respective cognitive domains. These cognitive domain T-scores were used as the dependent variables, and total QEd score was used as the independent variable, along with age, number of years of education and reading level/literacy. Age was entered into the regression model at step one, with number of years of education, literacy, and quality of education added in succession.

Hypothesis 1 was not supported for any of the four cognitive domains. QEd did not account for greater variance in neuropsychological tests score than age, number of years of education, or reading level/literacy. By contrast, reading level was a significant predictor of performance on the cognitive domains of attention/working memory, R^2

= .24, F(1, 39) = 12.14, p = .001, learning, R^2 = .22, F(1, 48) = 13.39, p = .001, verbal fluency, R^2 = .19, F(1, 48) = 11.46, p = .001, and executive functioning, R^2 = .12, F(1, 47) = 5.65, p = .02.

Hypothesis 2.

Hypothesis two predicted that African-Americans and Hispanics would obtain significantly lower scores on the QEd scale than Caucasians. A one-way ANOVA was used to test this hypothesis. Although Caucasian participants showed greater QEd scores than both African-American and Hispanic participants, as mentioned above, this difference was not significant, F(2, 47) = 1.05, p = .36. Results therefore, did not support the hypothesis.

Table 26. ***QEd scores by ethnic or racial group***

	Race/Ethnicity		
Total QEd	**Caucasian**	**African-American**	**Hispanic**
Mean	110.89	105.52	98.56
SD	22.84	24.74	21.42

Hypothesis 3.

Pearson's product-moment correlation was used to analyze the hypothesis that total QEd and WRAT-3 reading score would be significantly more correlated to each other than would total QEd and education level. The results of the correlational analyses presented in Table 27 show that QEd and WRAT-3 reading level are significantly correlated ($r = .28, p < .05$), and QEd and education level are also significantly correlated ($r = .42, p < .01$) with each other. Post-hoc sample correlation coefficient comparisons

(Cohen & Cohen, 1983), revealed that the two pairs of correlations are not significantly different from each other (t = -1.12, p>.05). Therefore, although the results reveal that QED is significantly correlated with both reading and education level, there is no significant difference between the two correlations.

Table 27. Pearson's correlation for Reading level, QEd, and number of years of education

	WRAT-3 Reading (r)	Education level (r)
Education level	**.56	1
QEd	*.28	**.42

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

<u>Hypothesis 4.</u>

QEd was hypothesized to be a significant predictor of Motivation for Achievement. The subsection of the QEd scale, Motivation for Achievement, was constructed to analyze the contribution of QEd to motivation as a mediator of neuropsychological performance. Table 28 presents descriptive information for the Motivation for Achievement scale. Scores were normally distributed. As previously stated, a significant race/ethnic group difference was found, F(2, 47) = 4.93, p = .01, with African-Americans showing higher scores than Hispanics (Table 22). A significant effect of recruitment group was also found, t(48)= - 2.23, p = .03, with participants from the CHARTER group showing higher scores than those from the MHBB group (Table 24).

Table 28. Descriptive statistics for Motivation for Achievement

	N	**Mean**	**SD**	**Range**
Motivation for Achievement	50	14.64	3.97	4-20

A linear regression analysis was conducted to examine the relationship between QEd and Motivation for Achievement. As hypothesized, results indicated that quality of education was a significant predictor of Motivation for Achievement, $R^2 = .20$, $F(1, 48) = 12.04$, $p = .002$. Table 29 displays the B, standard error, and β resulting from the regression analysis.

To further examine the variable Motivation for Achievement, a correlation analysis was conducted to determine its relationship to age. Results of the correlation analysis revealed that age and Motivation for Achievement were not significantly correlated ($r = .24$, $p = .10$). Therefore, level of motivation for achievement was not related to the age of the participants.

Table 29. Linear regression results from the prediction of Motivation for Achievement

Variable	B	SE B	β
QEd	.0063	.02	.45**

$R^2 = .20$
** $p < .01$

Exploratory Hypotheses

A linear regression analysis was conducted to examine the relationship between motivation for achievement and neuropsychological test performance. Although QEd was not found to be a significant predictor of neuropsychological performance, it was a predictor of motivation for achievement. We wanted to examine whether motivation for achievement had any impact on the relationship between QEd and cognitive performance. Results from the regression analysis showed that motivation for achievement was not a significant predictor of performance on motor, $R^2 = .001$, $F(1, 48) = .03$, $p = .86$; attention/working memory, $R^2 = .00$, $F(1, 48) = .00$, $p = .98$; speed of information

processing, $R^2 = .002$, $F(1, 48) = .11$, $p = .74$; learning, $R^2 = .03$, $F(1, 48) = 1.31$, $p = .26$; memory, $R^2 = .01$, $F(1, 48) = .40$, $p = .53$; verbal fluency, $R^2 = .01$, F(1, 48) = =.37, $p = .55$; or executive functioning, $R^2 = .003$, $F(1, 48) = .14$, $p = .71$. Therefore, motivation for achievement is not shown to be the mechanism underlying any relationship between QEd and cognitive performance.

Hypothesis 5.

High school transcript GPA was hypothesized to have a significant and positive correlation with self-reported academic performance. There were repeated attempts to retrieve the high school transcripts of all the participants in this study; only 10 transcripts, however, were received. All transcripts obtained were from participants recruited from the Manhattan HIV Brain Bank (MHBB). Demographic information for the 10 participants is presented in Table 30. Several one-way ANOVAs were conducted to examine group differences on GPA. There were no significant gender differences, $t(8) = -.22$, $p = .83$, however, significant race/ethnic group differences were found, $F(2, 7) = 17.68$, $p = .002$ (Table 31). Group comparisons revealed that the mean transcript GPA for Caucasian participants was significantly higher than that for Hispanics ($p = .003$). Similarly, transcript GPAs obtained for African-American participants were higher than for Hispanics ($p = .01$).

Table 30. Descriptive information for participants with returned high school transcripts

	Ethnicity			**Sex**		**Age**		**Education level (years)**		**Reading level (WRAT-3)**		**QEd**		**GPA**	
Variable	**C**	**A**	**H**	**M**	**F**	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Transcripts	2	3	5	7	3	46.3	5.6	13.7	2.9	44	10.7	119	31.5	1.5	1.4

Table 31. Transcript GPA by ethnic group

Group	N	Mean	SD
Caucasian	2	3.30	.06
African-American	3	2.33	.52
Hispanic	5	.35	.72

Table 32. Transcript GPA by gender

Group	N	Mean	SD
Male	7	1.46	1.44
Female	3	1.70	1.67

Self-reported academic performance in high school was transformed from letter grades (e.g., A/B) to numerical GPAs based on criteria suggested by the New York Department of Education GPA scale. Reported academic performance of multiple letter grades was averaged according to the respective grade point value and used in these analyses. For example, a self-reported cumulative performance of A/B resulted in an averaged GPA of 3.5. There were no significant gender, $F(1, 8) = 4.60$, $p = .06$, or race/ethnic group differences, $F(2, 7) = .92$, $p = .44$, for self-reported GPA (Tables 33, 34).

Table 33. Self-reported GPA by ethnic group

Group	N	Mean	SD
Caucasian	2	2.50	1.41
African-American	3	3.17	.58
Hispanic	5	2.30	.84

Table 34. Self-reported GPA by gender

Group	N	Mean	SD
Male	2	2.93	.79
Female	3	1.83	.58

Pearson's product-moment correlations were conducted to examine whether a significant and positive correlation existed between GPA, as reported on participant high school transcripts, and self-reported academic performance. Table 35 displays the means for each transcript type. Results from the correlation analysis showed a non-significant correlation coefficient of .17 for the association between self-reported GPA and GPA obtained from the high school transcripts; therefore, self-reported GPA and GPA obtained from the high school transcript were not significantly correlated with each other (Table 36). To further examine the relationship between transcript and self-reported GPA, a median split was conducted with this data. Correlation analyses did not reveal any significant relationship between the two variables (Table 37).

Table 35. Transcript and self-reported GPA

	Mean	SD
Transcript GPA	1.53	1.42
Reported GPA	2.60	.88

Table 36. Correlation between self-reported and transcript GPA

GPA	Self-Reported GPA
Transcript GPA	.17

Table 37. Descriptive data for median split transcript and self-reported GPA data

Self-reported GPA	Transcript GPA		
	Below median	**At median**	**Above median**
Below median	**1**	**1**	**1**
At median	**2**	**1**	
Below median	**1**		**3**

Hypothesis 6.

A correlation coefficient was computed between total QEd score and the GPA obtained from the high school transcript to examine the relationship between these two factors. We hypothesized that GPA would be positively correlated with total QED score. A non-significant positive correlation of .11 was found. To further examine the relationship between QEd and GPA, a median split was conducted on QEd and transcript GPA and a correlation analyses was conducted (Table 38). Similar to the first correlation analysis, no significant findings were found. This hypothesis, therefore, was not supported.

Table 38. Descriptive data for median split data on transcript and QEd data

QEd	Transcript GPA		
	Below median	**At median**	**Above median**
Below median	2	1	2
Above median	2	1	2

Hypothesis 7.

Pearson's product-moment correlation analysis was conducted to determine the association between scores on the Parent/Guardian Education and Involvement subscale of the QEd scale and scores from the different cognitive domains. Measures of executive functioning and verbal fluency compared to other cognitive domains were expected to be significantly, and more positively, correlated with scores on the Parent/Guardian Education and Involvement subscale of the QEd scale. Scores on the executive functioning domain revealed a negative correlation with the Parent/Guardian Education and Involvement subscale. Performance on verbal fluency also revealed a negative correlation with Parent/Guardian Education and Involvement. However, there were no significant correlations between scores on the Parent/Guardian Education and Involvement subsection and scores on any of the cognitive domains (Table 39).

Table 39. Correlation between Parent/Guardian Education & Involvement and cognitive domains

	Motor	**Attention/ Working memory**	**Speed of information processing**	**Lear-ning**	**Memory**	**Verbal fluency**	**Exe-cutive**
Parent/ Guardian Edu-cation & Involve-ment (r)	-.10	.02	-.06	.02	-.01	-.17	-.08

Hypothesis 8.

A multiple regression analysis examined whether the Attendance & Performance subscale was a more significant predictor of performance on the cognitive domains of learning and attention/working memory domains, compared to other cognitive domains.

In this analysis, scores on the Attention & Performance subscale served as the independent variable and age-adjusted cognitive domain T-scores served as the dependent variable. Results from the regression analyses revealed that the Attendance and Performance subscale of the QEd scale was not a significant predictor of performance in the domain of learning, $R^2 = .01$, $F(1, 48) = .64$, $p = .43$; attention/working memory, $R^2 = .21$, $F(1, 39) = 1.80$, $p = .19$; or any of the remaining five cognitive domains. Tables 40 and 41 display the B, β, and standard error values resulting from the analyses of learning and attention/working memory, respectively.

Table 40. Summary of linear regression analysis for the prediction of performance on learning from the Attendance & Performance subscale

Variable	B	SE B	β
Attendance & Performance	-.38	.48	-.12
$R^2 = .01$			

Table 41. Summary of linear regression analysis for the prediction of performance on attention/working memory from the Attendance & Performance subscale

Variable	B	SE B	β
Attendance & Performance	-.58	.43	-.21
$R^2 = .24$			

Hypothesis 9.

Hypothesis 9 examined the relationship between high school employment and GPA. Pearson's correlation analysis was previously stated as the means of examining this relationship. However, because only 10 of the total sample's transcripts were obtained, we performed a t-test analysis on the sample of 10. The dependent variable

was transcript GPA. The independent variable was employment. Results showed that employment during high school was not associated with lower GPA. Additionally, the mean differences in GPA between unemployed and employed participants was not significant, $F(1, 8) = 1.49$, $p = .26$ (Table 42).

Table 42. GPA results for employed and unemployed participants

Group	N	Mean	SD
Employed	5	2.07	1.29
Unemployed	5	1.00	1.47

Discussion

The current study was conducted to examine the amount of variance in neuropsychological test scores accounted for by quality of education (QEd) in an HIV/AIDS population. In addition, this study examined whether scores on QEd measure accounted for more variance than reading level/literacy and/or number of years of education. A novel, comprehensive, self-report interview, the Baird Quality of Education Scale, was developed and administered to a sample of 50 African-American, Caucasian, and Hispanic HIV^+ adults to determine if discrepancies in quality of education were related to neuropsychological test performance.

Quality of Education

The primary purpose of this study was to examine whether differences in QEd obtained during high school were predictive of neuropsychological test performance. Previous literature on the impact of QEd has utilized a single measure, the Reading Subtest of the WRAT-3. To our knowledge, this was the first study that utilized a questionnaire consisting of environmental and subjective factors related to educational quality to assess the contribution of QEd to neuropsychological test performance.

Despite the proposed hypotheses, QEd, as measured by scores on the Baird Quality of Education Scale, did not prove to be a significant predictor of performance on neuropsychological test performance above and beyond age, number of years of education, and reading level/literacy. However, reading level/literacy, as measured by scores on the Reading Subtest of the WRAT-3, was found to be a significant predictor of neuropsychological test performance. Although our primary hypothesis was not supported, the finding of reading as a predictor of neuropsychological test performance

was consistent with previous studies that have found a positive relationship between literacy and neuropsychological test performance both in HIV/AIDS (O'Bryant et al., 2005) and Alzheimer's Disease (Manly et al., 2002) populations. In addition, reading level/literacy was found to be correlated with number of years of education, which was correlated with scores on the QEd scale. Therefore, greater levels of literacy are associated with greater academic achievement, and greater academic achievement is associated with greater levels of educational quality. This finding is consistent with other reports of an association between reading level and academic achievement (e.g., Hedges et al., 1994; Wilkinson, 1993).

While QEd did not account for greater variance than reading and education level in neuropsychological test performance, it is not surprising that reading level/literacy served as a predictor of cognitive performance. Reading level has been shown to be a sensitive predictor of cognitive functioning in several populations (Baker et al., 1996; Manly et al., 2003; Manly et al., 2005; O'Bryant et al., 2004; Ryan et al., 2005). The consistency of this finding further evidences and supports the importance of accounting for literacy level, when assessing cognitive functioning. Reading level in this study was measured using the Reading Recognition Subtest of the WRAT-3, however, the Baird Quality of Education Scale, our measure for QEd, is a subjective measure which relies on self-report and intact memory functioning. Memory functioning, however, has been known to be one of the cognitive functions to decline in an HIV/AIDS population (Heaton et al., 1995). Therefore, utilizing a self-report measure that relied on memory, which could lead to response bias, could have confounded our findings and the interpretation of the data.

Finally, an objective measure of performance, GPA, was obtained, and its relationship to QEd examined. Results showed that GPA, too, was not predictive of neuropsychological test performance. This might be attributed to the very low number of transcripts actually obtained (n=10) and, to the fact that the majority of the GPAs were very low on the 0.00 - 4.00 scale (i.e., 4 GPAs of "0.00" and 2 GPAs of "1.75").

QEd and Motivation for Achievement

The current study proposed motivation for achievement as the underlying mechanism involved in quality of education. As expected, results showed that QEd was a significant predictor of motivation for achievement. Therefore, as the degree of QEd varies, so does the level of motivation of achievement. Exploratory Pearson product-moment correlation analyses were conducted to examine which subscales of the QEd scale were driving the relationship between Motivation for Achievement and QEd. These analyses were also conducted to explore the relationship between Motivation for Achievement and neuropsychological test performance. Of the seven cognitive domains assessed, none were correlated with Motivation for Achievement. Results of the analyses, however, did find significant positive correlations between Motivation for Achievement and 5 out of the 10 QEd subscales. More specifically, Motivation for Achievement was shown to have medium to large correlations with Perception of Teachers, Student/Teacher ratio, Testing, Parent/Guardian Education and Involvement, Extracurricular Activities, and Overall QEd (Table 43), suggesting that the degree of motivation for achievement varies with scores for these subscales.

Table 43. Pearson's correlation of Motivation for Achievement and QEd subscales

	Motivation for Achievement (r)
Availability of Specialized Classes	.08
Perception of Teachers	.39**
Student/Teacher Ratio	.41**
Testing	.39**
Facility condition	.26
Availability of academic & supplemental resources	.19
Attendance & Performance	.20
Parent/Guardian Education & Involvement	.54**
Overall QEd	.34*

** Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.

In sum, the finding in this study of the predictability of QEd and motivation for achievement may suggest that the level of motivation for achievement is related to or contingent on one's perception of the quality of education obtained during high school.

Generalizability of the Results

Considering the specificity of the participant pool, it is unlikely that the findings from this study would extend to the general population. The sample consisted of HIV^+ participants in the larger MHBB and/or CHARTER studies at Mount Sinai Medical Center, and all participants attended high school in New York State, with the large majority (n = 46) attending high school within the city of New York. In addition, there

was an overrepresentation of ethnic minorities within the sample pool (n = 41). These factors may limit the generalizability of the findings.

When scores for QEd were examined, no differences were found between individuals who attended high school in New York City (NYC; n = 46) and those who attended high school in the greater New York area (n = 4). In addition, the comparison between non-NYC high school participants and NYC high school participants on neuropsychological test performance across all cognitive domains did not reveal any significant group differences. These insignificant results could be attributed to the small sample of participants who attended high school outside of the NYC area. As such, generalizability of the results from this study to other HIV^+ populations may be valid to other inner city, HIV^+, ethnic minority, populations, but may not apply to an HIV-negative, rural, non-ethnic minority, population.

Strengths of the Current Study

The current study has a number of strengths. First, although QEd as measured by the QEd scale, did not account for significant amounts of variance in neuropsychological test performance in this study, literacy, as measured by scores on the Reading Subtest of the WRAT-3, emerged as the greatest indicator of cognitive performance. This finding is consistent with the literature (Manly et al., 2002; O'Bryant et al., 2004) which reports a decrease in rates of cognitive impairment between minorities and Caucasians when accounting for reading level versus level of education. Therefore, the current study further reiterates the advantages of controlling for reading level in the assessment of cognitive functioning and the inaccuracy of matching racial/ethnic groups on number of years of education, alone, when assessing cognitive functioning. In other words, literacy

level continually appears to be a robust contributing factor in the variability reported in neuropsychological test performance between groups.

Another strength of the current study lies in the tool used to assess quality of education. The Baird Quality of Education Scale was comprised of 9 subscales which assessed multiple aspects of QEd as opposed to the one dimensional measure of QEd, reading level, utilized in previous studies. The use of multiple subscales associated with QEd also allowed for the examination of the contribution of each factor to NP performance.

The Baird Quality of Education Scale is a self-report measure, which relies on the ability of participants to be honest and accurate in their recall of events throughout high school. This subjectivity and dependence on self-report can create doubt regarding the validity of individual responses. On the other hand, the results of the reliability analyses conducted provide statistical evidence for the internal consistency and reliability of the scale. The low correlation ($r = .17$) between self-reported GPA and transcript GPA suggests, however, raised questions about the criterion validity of the scale.

Although the QEd scale was shown to be a reliable assessment tool, we were also interested in examining the reliability of participant responses to the questionnaire. Participants were asked to indicate the accuracy with which they were able to recall the events/topics asked of them throughout the questionnaire. This score was recorded as their recall accuracy. Pearson's correlation coefficients were computed between recall accuracy and the seven cognitive domains. Results of the correlation analyses presented in Table 44 show that five correlations were statistically significant. Recall accuracy was significantly correlated with measures of attention/working memory, learning, memory,

verbal fluency, and executive functioning. These findings suggest that recall accuracy varied with performance on the five above mentioned cognitive domains. Interestingly, the correlation between recall accuracy was strongest with the domains of learning and memory, which assesses the ability to encode and recall information over a period of time. Furthermore, the findings emphasize the importance of subjective experiences and perceptions gained through a self-report measure.

Table 44. Correlations between Recall accuracy and neuropsychological tests

Cognitive domain	Recall Accuracy (r)
Motor	.07
Speed of information processing	.23
Attention/working memory	.36*
Learning	.41**
Memory	.38**
Verbal fluency	.34*
Abstract/executive fxn	.32*

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

<u>Limitations of the current study</u>

There are several limitations to this study. First, although the internal consistency of the QEd scale was demonstrated, the fact remains that it is a subjective measure of educational quality. More objective measures of QEd by the school or the school district (e.g., via budget summaries, quality review reports, or attendance percentage reports) would be needed to verify participant responses. Secondly, although participants' ratings for recall accuracy were found to be strongly correlated with the cognitive domains of

learning and memory, memory is one of the primary cognitive deficits known to occur with the progression of HIV. Because memory deficits are common to HIV, the risk of falsifying or unconsciously omitting information is greater when using a self-report measure than when using more objective or verifiable assessment tools. In addition, the overall low sample size for the entire study, that fact that racial/ethnic groups were not evenly matched on number of participants or QEd, as well as the fact that there was not a randomly selected sample may have limited the statistical power and influenced the findings.

Furthermore, the format of the QEd scale may have limited the richness or utility of information gained. The scale consisted of 9 subscales with a total of 2-4 items contributing to the score for any particular item. It may have been more systematic if all subscales had an equal number of items, thereby decreasing the possibility of unequal weighting among the subscales. In addition, the scale was analyzed quantitatively, which may have omitted important and contributing qualitative information related to QEd. Also, related to the format of the QEd measure is the content covered in the scale. It is possible that other factors related to QEd (i.e., extracurricular activities, number of high schools attended, and traumatic experiences during high school) may have enhanced the comprehensiveness of the study and/or provided different results. Lastly, the QEd scale is a newly developed scale that has not yet been normed on healthy individuals or validated. For these reasons, the findings of the current study may be limited.

It is possible that disease state, medication adherence, and mood may have had an effect on cognitive performance. The current study did not control for stage of illness, which may impact cognitive functioning. Advanced stages of HIV have been associated

with changes in neuropsychological function (Bornstein, et al., 1992; Grant et al., 1987; Heaton et al., 1995; McAllister et al., 1992; McArthur et al., 1989). Furthermore, we did not account for prevalence of depression or compliance to medication as factors in cognitive performance. Depression is a common occurrence in an HIV^+ population, with higher rates in inner city minorities (Brown et al., 1992; Chuang, Jason, & Pajurkova, 1992; Gala et al., 1993; Lyketsos, Hanson, Fishman, McHugh, & Treisman, 1994). Depression negatively affects cognitive functioning, especially in the areas of attention and processing speed, and non-adherence to antiretroviral medications has been shown to be related to depression (Ammassari et al., 2004), however, a current state of depression could negatively influence recall, attention, and motivation; all factors necessary for the accurate completion of the QEd scale. Therefore, not controlling for mood and/or compliance rates in this study, may have limited the results of the data.

Future directions

This study was the first to utilize a comprehensive questionnaire to examine the impact of QEd on cognitive performance across racial/ethnic groups. The current study should be replicated in other populations (e.g., Alzheimer's disease), which have evidenced ethnic group differences in cognitive performance. Furthermore, for the issues and hypotheses to be better examined, the current study should be replicated with a larger sample of HIV-positive individuals. Given the reports of lower performance on neuropsychological tests for African-American and Hispanics relative to Caucasians, as well as a higher prevalence of HIV/AIDS in the minority population, it is essential to identify factors that may contribute to the assessment of neuropsychological impairment in this population. In this literature, reading level has consistently been reported as a

significant predictor of cognitive functioning (Manly et al., 2002, Manly et al., 2005; O'Bryant et al., 2004). Our findings are consistent with that literature and suggest that educational quality, as captured by the Baird Quality of Education Scale, did not account for the difference in performance, above and beyond reading or education level, among HIV^+ ethnic groups.

The effects of age, education, reading level, and now, quality of education in a more comprehensive manner than previously defined in the literature, on neuropsychological performance in an HIV^+ population have been examined. Future studies also should examine other variables (i.e., occupation, leisure activities) that may influence cognitive performance using the cognitive reserve model (Stern, 2002). The cognitive reserve model suggests that the relationship between any pathologic insult or effect on cognitive function is mediated through reserve. In other words, an individual with more cognitive reserve is more able to endure more pathology, prior to showing neurobehavioral impairment or deficit. The exploration of variables associated with the cognitive reserve model could guide potential new research in the examination of neuropsychological performance among racial/ethnic groups.

APPENDIX A. AIDS Defining Illnesses

- Candidiasis of bronchi, trachea, or lungs
- Candidiasis, esophageal
- Cervical cancer
- Coccidioidomycosis, disseminated or extrapulmonary
- Crytococcosis, extrapulmonary
- Cryptosporidiosis, chronic intestinal
- Cytomegalovirus retinitis (loss of vision)
- Encephalopathy, HIV-related
- Herpes simplex
- Histoplasmosis, disseminated or extrapulmonary
- Isosporiasis, chronic intestinal
- Kaposi’s sarcoma
- Lymphoma
- Mycobacterium avium complex or M. Kansasii
- Mycobacterium tuberculosis
- Pneumonia carinii pneumonia
- Pneumonia
- Progressive multifocal leukoencephalopathy
- Salmonella septicemia
- Toxoplasmosis of the brain
- Wasting syndrome due to HIV

APPENDIX B. Abbreviated Terms

ADLs - Activities of Daily Living

AIDS - Acquired Immunodeficiency Disease Syndrome

CDC - Centers for Disease Control

CNS - Central Nervous System

CSF - Cerebrospinal Fluid

HAD - HIV-associated Dementia

HIV- Human Immunodeficiency Virus

HIVE - HIV Encephalitis

IVDU - Intravenous Drug Use

IVDUs - Intravenous Drug Users

MCMD - Minor Cognitive Motor Disorder

MSM - Men who have sex with men

NYC - New York City

QEd - Quality of Education

SIV - Simian Immunodeficiency Virus

YMS - Young Men’s Survey

APPENDIX C. Questionnaire Screening Criteria

Quality of Education Study
Screening Criteria

MHBB IB: _________________
Date: _________________
Name (First, Last): _____________________
Phone number: ______________
DOB: _______________
Gender(circle): Male Female

Introduction: Hello. I am calling to ask you to participate in a screening evaluation for a research sub-study in MHBB on aspects of your high school education. You are being invited because you are already involved in a research study at the Manhattan HIV Brain Bank (MHBB). The purpose of this screening is to find out whether you are eligible to participate in this new research study. Are you willing to answer a few short questions to see if you qualify for the study?

Instructions. Circle the answer that best fits the following questions.

Question						
1. **Where were you born?	**U.S.**	**Puerto Rico**	**Dominican Republic**	**Other**		
2. **What is your first/native language?	**Spanish**	**English**	**Other**			
3. **Where did you attend high school?	**Manhattan**	**Brooklyn**	**Bronx**	**Staten Island**	**Queens**	**Other**
4. What grade in high school did you finish?	**9**	**10**	**11**	**12**		
5. Do you have any difficulty with hearing?	**Yes**	**No**				

<u>Examiner information only</u>

Subject meets criteria (**responses must be unshaded in order to meet criteria for participation)	<u>Yes</u>	<u>No</u>
Date of Appointment		
Time of appointment		

Criteria met: You have passed the screening. I would now like to set up an appointment to have you come in and participate in the study. It will take approximately one hour, and you will be compensated $10 for your time.

Criteria not met: I am sorry. We cannot include you for this particular study but we do look forward to seeing you on your next visit to the MHBB.

APPENDIX D. Baird Quality of Education Scale

Baird's Quality of Education Scale
Participant # _________________
Age _______ Gender ______ Ethnicity _________
Date _______________
Time start ________ Time End _________

Total [ ]

This questionnaire is designed to assess the quality of education you received during high school. There will be questions about your high school teachers, the number of students in your classes, the availability of educational materials, physical conditions of the school, your attendance, parents/guardians, employment, extracurricular activities you may have participated in, and questions related to motivation. Please feel free to ask me any questions as we go along. First, I would like to ask you some questions about yourself.

Background

1. Tell me about your high school:

____
____
____
____
____

2. Where did you go to high school (enter A-E)? Did you attend more than one high school?

0 - Yes **1 - No (skip to #4)**

A. Name of school (in order attended)	B. Years attended	C. Ages in school (xx-xx)	D. Location (city)	E. Public/Private	F. Reason for change in school

3. What were the circumstances surrounding each change of school?
   5 - Behavioral (e.g., expulsion, misbehavior)
   4 - Medical/health
   3 - Family-related (e.g., change in occupation)
   2 - Educational (e.g., better school district/system)
   1 - Other, please specify 0 - Multiple reasons (for data entry only)

4. How many years of formal schooling did you complete?
   # of years ______ (if < 12 years, go to question #5)

5. What are the reasons that you did not complete high school?
   5 - Behavioral (e.g., expulsion, misbehavior) 2 - Educational (e.g., better school district/system)
   4 - Medical/health 1 - Other, please specify ________________
   3 - Family-related (e.g., change in occupation) 0 - Multiple reasons (for data entry only)

Availability of specialized classes (1-20 points)
The following questions are related to the types of classes and programs that your high school offered

**6. Did your high school have honors classes?
5-Yes ________ 1 - No _________ (skip to #7)
999 - Don't know
6a: Did you think that there was a difference between the teachers in your honors classes and those that did not teach honors classes?
____
____
____
____

6b: Did you think there was a difference between the materials (e.g., text books) supplied between honors and non-honors classes?
____
____
____
____

**7. Did your high school have a gifted and talented program?
5 -Yes ________ 1 - No _________ 999 - Don't know

**8. Did your high school offer remedial classes?
5 -Yes ________ 1 - No _________ 999 - Don't know

**9. Did your high school offer any after school tutoring?
5 -Yes ________ **1 - No _________** **999 - Don't know**

10. Were you ever told that you had a learning disability?
0 - Yes_______ What kind? _________ When/What grade? ____________
1 - No_______ (skip to question #12)

11. Who told you that you had a learning disability?
1 - Psychologist **2 -Teacher** **0 - Other _______________**

12. Were you ever left back or did you repeat a grade in high school?
0 -Yes __________ What grade(s) ___________Reason(s) ________________
1 - No

Perceptions of Teachers (4-20 points)
The next set of questions are related to your high school teachers and the number of students in your classes. On a scale from 1 to 5, with 5 being the highest, please answer the following questions:

**13. On average, how prepared to teach, in terms of being organized and ready to teach, were your high school teachers?
5 - Extremely prepared **2 - Somewhat prepared**
4 - Very prepared **1 - Not at all prepared**
3 - Moderately prepared

**14. On average, how concerned were your high school teachers about your high school academic performance?
5 - Extremely concerned **2 - Somewhat concerned**
4 - Very concerned **1 - Not at all concerned**
3 - Moderately concerned

**15. On average, please rate how dedicated your high school teachers were to making sure you learned the subject they were teaching?
5 - Extremely dedicated **2 - Somewhat dedicated**
4 - Very dedicated **1 - Not at all dedicated**
3 - Moderately dedicated

**16. We just talked about your teachers' preparation, concern for your academic achievement, and dedication. Now, please rate the average overall quality of your teachers in high school, in terms of their ability to teach the target subject?
5 - Extremely qualified **2 - Somewhat qualified**
4 - Very qualified **1 - Not at all qualified**
3 - Moderately qualified

Student/Teacher Relationship (4-20 points)

**17. On average, please rate how well your high school teachers were able to maintain control of your classes?

5 - Extremely able to control the class **2 - Somewhat able to control the class**
4 - Very able to control the class **1 - Not at all able to control the class**
3 - Moderately able to control the class

**18. On average, please rate how well your high school teachers were able to engage or sustain the attention of students?

5 - Extremely well **2 - Somewhat**
4 - Very well **1 - Not at all**
3 - Moderately

**19. What was the average size of most of your classes in high school? __________

5 - 1 to10 **2 - 31-41**
4 - 11 to 20 **1 - 42 to 51**
3 - 21 to 30
1 - 42 to 51

**20. On a scale from one to five, how crowded would you say your typical class was?

5 - Extremely crowded **2 - Somewhat crowded**
4 - Very crowded **1 - Not at all crowded**
3 - Moderately crowded

Testing (4-20)

This portion of the questionnaire addresses different types of tests you may have taken in high school.

21. Do you remember taking any standardized state assessment tests or tests necessary to go onto the next grade (e.g., ELA 9-12, Regents Exam, etc.) while in high school?

2 - Yes **1 - No (skip to question #24)**

**22. How well did you do on these tests?

5 - Very well **2 - Poor**
4 - Good **1 - Failed**
3 - Fair

23. Who told you how well you did on these tests?
____
____

24. Did you take the SATs (Scholastic Achievement Test), the test needed to get into college?

2 - Yes **1 - No**

**25. How much was the importance of testing, in general, stressed during high school?

5 - Extremely **2 - Somewhat**
4 - Very **1 - Not at all**
3 - Moderately

**26. Was the importance of doing well on tests stressed during high school?

5 - Extremely **2 - Somewhat**
4 - Very **1 - Not at all**
3 - Moderately

**27. Did you think it was important to do well on tests during high school?

5 - Extremely **2 - Somewhat**
4 - Very **1 - Not at all**
3 - Moderately

Facility Condition (0-20 points)

The following questions ask about educational materials, conditions of your school, and your attendance in high school. On a scale from 1 to 4, with 4 being the best, please answer the following questions:

**28. How would you rate the overall level of safety, in terms of crime, in your high school?

4 - Excellent **1 - Poor**
3 - Good **999 - Don't know**
2 - Fair

**29. How would you rate the overall cleanliness of the facilities (e.g., bathroom, classroom, and cafeteria) in high school?

4 - Excellent **1 - Poor**
3 - Good **999 - Don't know**
2 - Fair

**30. Please rate the average interior condition of your high school. For example, how was the noise, the heat or coldness in school?

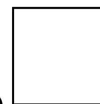
4 - Excellent **1 - Poor**
3 - Good **999 - Don't know**
2 - Fair

**31. In thinking about the quality of the overall physical structure (e.g., roof, walls, and windows) of your high school, please rate the physical condition of your high school from 1 to 4, with 4 being the best.

4 - Excellent **1 - Poor**
3 - Good **999 - Don't know**
2 - Fair

**32. What was the condition of your desks and chairs in high school?

4 - Excellent **1 - Poor**
3 - Good **999 - Don't know**
2 - Fair

Availability of academic and supplemental resources (0-20) 

**33. What was the quality of activity rooms, such as the gym, auditorium, and/or music room like in your high school?

4 - Good **1 - Did not have those rooms**
3 - Fair **999 - Don't know**
2 - Poor

**34. What was the overall quality of the computer room like in your high school?

4 - Good **1 - Did not have those rooms**
3 - Fair **999 - Don't know**
2 - Poor

**35. What was the quality of the library like, in terms of cleanliness and availability of materials, in high school?

4 - Good **1 - Did not have a library**
3 - Fair **999 - Don't know**
2 - Poor

**36. What was the quality of the textbooks like in the classrooms throughout high school?

4 - Good **1 - Did not have enough for everyone**
3 - Fair **999 - Don't know**
2 - Poor

**37. What was the quality of any program (e.g., DARE) or class in high school about the use of drugs?

4 - Good **1 - Did not have a class or program like this**

3 - Fair **999 - Don't know**
2 - Poor

38. What else can you tell me about the overall physical and internal condition of your high school?
____
____
____
____

Attendance & Performance (0-20 points)

**39. Approximately how many days or weeks did you miss in high school on average? ___________
4 - Never missed a day (skip to #41) **1 - More than 2 weeks/ 10 days or more**
3 - Up to one week/5 days **999 - Don't know**
2 - One to two weeks/up to 10 days

40. What were the typical reasons that you missed school?

4 - Health/medical problems **1 - Other ______________**
Disinterest in school **999 - Don't know**
2 - Behavioral problems (e.g., suspension) **888 - Multiple reasons (data entry only)**

**41. Were there truancy officers in your high school effective?

4 - Very effective **1 - Did not have any**
3 - Somewhat effective **999 - Don't know**
2 - Not at all

**42. How well did you do in any honors classes you were in during high school?

4 - Good **1 - Was not in any honors classes**
3 - Fair **999 - Not offered**
2 - Poor

**43. How well did you do in any remedial classes you were in during high school?
4 - Was not in any remedial classes **1 - Poor**

3 - Good **999 - Not offered**
2 - Fair

44. Did you ever receive any special tutoring for subjects you needed help with in high school?
3 -Yes _____ **1 - No ______** **999 - Not offered**

**45. What were your grades like in high school?
4 - A/B student
3 - B/C student
2 - C/D student
1 - D/F student
999 - Don't know

Parental education and involvement (0-20 points)

The following questions are related to your parents/gu[illegible] interactions during your years in high school, as well as any extracurricular and employment activities you participated in during high school.

46. With whom did you live with the longest during high school? (Circle all the apply)
6 - Parents/Immediate family
5 - Grandparents
4 - Secondary family (e.g., aunts, uncles)
3 - Sibling(s)
2 - Friends
1 - Other_______________
0 - Multiple (data entry only)

47. Of the household members you lived with, who was the most concerned and involved with your education? ______________________
5 - Parents/Immediate family
4 - Grandparents
3 - Secondary family (e.g., aunts, uncles)
2 - Sibling(s)
1 - Friends
O - Other______________

48. When you needed help with homework, who usually helped you?
____
8 - Did not usually do homework
7 - Parent/guardian
6 - Grandparents
5 - Secondary family members (e.g., aunts, uncles)
3 - Friend
2 - After school program
1 - No one (skip to #50)
0 - Other_______________

49. What was the level of education of this person (refers to person stated in #48)?
# of years ______
999 - Don't know

50. What was the highest level of education obtained by any your parent(s)/guardian? ________________

# of years________
999 - Don't know

**51. Were your parents/guardians employed?

5 - All the time	**2 - Rarely**
4 - Frequently	**1 - Never**
3 - Occasionally	**999 - Don't know**

51a. **2 - Full-time** **1 - Part-time** **3 - Both**

51b. What was their occupation or the job the parent held during that time?___________________
____
____

**52. How often would your parents/guardians ask about your schoolwork?

5 - All the time	**2 - Rarely**
4 - Frequently	**1 - Never**
3 - Occasionally	**999 - Don't know**

**53. How often would your parents/guardians look at your report card?

5 - All the time	**2 - Rarely**
4 - Frequently	**1 - Never**
3 - Occasionally	**999 - Don't know**

**54. How often did your parents/guardians attend parent/teacher conference meetings or open house at your high school?

5 - All the time	**2 - Rarely**
4 - Frequently	**1 - Never**
3 - Occasionally	**999 - Don't know**

Extracurricular activities (0-20 points) ☐

**55. Were you involved in any extracurricular activities (e.g., basketball, cheerleading, debate club, math club, student government) after school?

10 -Yes (please specify)

55a**. Sports** _________________________________

Non-sports related _______________________________

55b. **A**pproximately how many hours per week did you participate in these activities? _______

0 - No ________ (skip to question # 57)

**56. Approximately how long did you take part in these extracurricular activities?

10 - 4 years of more **4 - 1 years**
8 - 3 year/4 or more **2 - less than year**
6 - 2 years **999 - Don't know**

Employment during High School

57. Did you work during high school?

1 - Yes **0 - No (skip to #59)**

A. Name of company	B. Position held	C. Ages employed	D. Amount of time at position (e.g., months, years)	E. No. of hours per week at position	F. Reason(s) for working

58. How much did working during high school affect your education?

3 - Very much affected **1 - Somewhat**

2 - Moderately affected **0 - Not at all/Did not have an effect**

Overall QEd (1-20 points)

**59. In thinking about your classes, teachers, student/teacher relationships, high school facility, attendance and performance, parental education, parental involvement in your education and extracurricular activities, what would you say is your overall perception of the quality of education you received during high school?

20 - Excellent **5 - Fair**
15 - Very good **1 - Poor**
10 - Good **999 - Don't know/Can't say**

Motivation for achievement (4-20 points)

Finally, I want to know about some of your views of yourself during high school.

**60. How much did you believe that if you tried hard enough during high school that you could do your schoolwork well?

4 - Very **2 - Somewhat**

3 - Moderately **1 - Not at all**

**61. How important was learning to you during high school?

4 - Very important **2 - Somewhat important**

3 - Moderately important **1 - Not at all important**

**62. When you really understood what was being taught during high school, how pleased were you with yourself?

4 - Very pleased **2 - Somewhat pleased**

3 - Moderately pleased **1 - Not at all pleased**

**63. During high school, before you started an assignment, how often would you plan how you were going to complete it?

4 - All the time (go to 63a) **2 - Rarely (go to 63b)**

3 - Occasionally (go to 63a) **1 - Never (go to 63b)**

63a. How did you go about planning how to complete an assignment?

____
____
____
____
____

63b. You said you never or rarely planned how to start an assignment. What would you do to start it?

____
____
____
____
____
____

**64. During high school, if you did not understand your homework at first, how often would you keep going over it until you understood it?

4 - All the time **2 - Rarely (go to 64a)**
3 - Occasionally **1 - Never (go to 64a)**

64a. You stated that you never or rarely went over your homework if you did not understand it. Why was that?

____
____
____
____

65. Is there anything else that you would like to tell me about the quality of your high school education?

____
____
____
____
____
____

66. How would you rate the accuracy at which you recalled the events during high school that we just went over?

5 - Extremely accurate
4 - Very accurate
3 - Moderately accurate
2 - Somewhat accurate
1 - Not at all accurate

Behavioral Observations/Notes:

____
____
____
____
____
____

References

Adams, R., Boake, C, & Crain, C. (1982). Bias in a neuropsychological test classification related to education, age, and ethnicity. *Journal of Consulting and Clinical Psychology*, *50*, 143-145.

Albert, S. & Teresi, J. (1999). Reading ability, education and cognitive status assessment among older adults in Harlem, New York City. *American Journal of Public Health*, *89*, 95-97.

American Academy of Neurology AIDS Task Force (1991). Nomenclature and research case definitions for neurologic manifestations of human immunodeficiency virus-type 1 (HIV-1) infection. *Neurology*, *41*, 778-785.

Ammassari, A, Antinori, A., Aloisi, M., Trotta, M., Murri, R., Bartoli, L., Monforte, A.D., Wu, A., & Starace, F. (2004). Depressive symptoms, neurocognitive impairment, and adherence to highly active antiretroviral therapy among HIV-infected persons. *Psychosomatics*, *45*, 394-402.

Appalachia Educational Laboratory, Charleston, W.V. (1997). Let's Ask the Students…Kentucky, Tennessee, Virginia, and West Virginia Students Talk about School and Change.

Ardila, A., Rosselli, M., Matute, E., & Guajardo, S. (2005). The influence of the parents' educational level on the development of executive functions. *Developmental Neuropsychology*, *28*, 539-560.

Astone, N. & McLanahan, S. (1991). Family structure, parental practices, and high school completion. *American Sociological Review*, *56,* 309-320.

Atkinson, J., Grant, I., Kennedy, C., Richman, D., Spector, S. & McCutchan, J. (1988). Prevalence of psychiatric disorders among men infected with human immunodeficiency virus: A controlled study. *Archives of General Psychiatry*, *45*, 859-864.

Baker, F.M., Johnson, J.T., Velli, S.A., & Wiley, C. (1996). Congruence between education and reading levels of older persons. *Psychiatric Services*, *47*, 194-196.

Barker, R. & Gump, P. Big school, small school: High school size and student behavior. Stanford, California: Stanford University Press, 1964.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191-215.

Bandura, A. (1997). Self-efficacy. *The exercise of control*. New York: W.H. Freeman.

Basso, M. & Bornstein, R. (2000). Effects of immunosuppression and disease severity upon neuropsychological function in HIV infection. *Journal of Clinical and Experimental Neuropsychology*, *22*, 104-114.

Bauer, S. (1999). Should achievement tests be used to judge school quality? Paper presented at the Annual Meeting of the American Evaluation Association, Orlando, Fl, November 3-6, 1999.

Benedict R.H. (1997). *Brief visuospatial memory test-revised*. Odessa, Florida: Psychological Assessment Resources.

Benedict, R.H., Schretlen D., Groninger L., Brandt J. (1998). Hopkins verbal learning test-revised: normative data and analysis of inter-form and test-retest reliability. *The Clinical Neuropsychologist*, *12*, 43-55

Berger, J. & Nath, A. (1997). HIV dementia and the basal ganglia. *Intervirology*, *40*, 122-131.

Bing, E., Burnam, A., Longshore, D., Fleishman, J., Sherbourne, C., London, A., et al. (2001). Psychiatric disorders and drug use among human immunodeficiency virus-Infected Adults in the United States. *Archives of General Psychiatry*, *58*, 721-728.

Bjorklund, D. & Weiss, S. (1985). Influence of socioeconomic status on children's classification and free recall. *Journal of Educational Psychology*, *77*, 119-128.

Bogart, L., Kral, A., Scott, A., Anderson, R., Flynn, N., Gilbert, M., et al. (2005). Sexual risk among injection drug users recruited from syringe exchange programs in California. *Sexually Transmitted Diseases*, *32*, 27-34.

Bornstein, R., Nasrallah, H., Para, M. Whitacre, C., Rosenberger, P., Fass, R., & Rice, R. (1992). Neuropsychological performance in asymptomatic HIV infection. *Journal of Neuropsychiatry and Clinical Neurosciences*, *4*, 336-394.

Bouffard-Bouchard, T. (2001). Influence of self-efficacy on performance in a cognitive task. *The Journal of Social Psychology*, *130*, 353-363.

Brooks, J., Balka, E., Abernathy, T., & Hamburg, B. (1994). Sequence of sexual behavior and its relationship to other problem behaviors in African American and Puerto Rican adolescents. *Journal of Genetic Psychology*, *155*, 107-114.

Brown, G., Rundell, J., McManis, S, Kendall, S., Zachary, R., & Temoshok, L (1992). Prevalence of psychiatric disorders in early stages of HIV infection. *Psychosomatic Medicine*, *54*, 588-601.

Card, D. (1999). The causal effect of education on earnings. In Orley Ashenfelter & David Card (Eds.) *Handbook of Labor Economics*, 3A, (pp. 1801-1863). New York: Elsevier.

Carey, K. (2004). The Funding Gap 2004. Many states still short change low-income and minority students. *The Education Trust, 2004*, 1-17.

Carroll, T., Fulton, K., Abercrombie, K. & Yoon, I. (2004). Fifty Years After Brown v. Board of Education: A two-tiered education system (2004). The National Commission on Teaching and America's Future. Washington, DC; 202-429-2570. The report is available online at www.nctaf.org/documents/nctaf/Brown%5fFull%5fReport%5fFinal.pdf

Carter, S., Rourke, S., Murji, S., Shore, D., & Rourke, B. (2003). Cognitive complaints, depression, medical symptoms, and their association with neuropsychological functioning in HIV infection: A structural equation model analysis. *Neuropsychology*, *17*, 410 - 419.

Catania, J., Osmond, D., Stall, R., Pollack, L., Paul, J., Blower, S., et al. (2001). The continuing HIV epidemic among men who have sex with men. *American Journal of Public Health*, *91*, 907-914.

Ceci, S. & Williams, W. (1997). Schooling, intelligence, and income. *American Psychologist, 52*, 1051-1058.

Centers for Disease Control and Prevention. (1997). U.S. Department of Health and Human Services. Guidelines for School and Community Programs to Promote Lifelong Physical Activity among Young People. *Morbidity and Mortality Weekly Report*.

Centers for Disease Control and Prevention. (1981a). Pneumoncystis pneumonia-Los Angeles. *MMWR: Morbidity & Mortality Weekly Report*, *30*, 250-252.

Centers for Disease Control and Prevention. (1981b). Kaposi's sarcoma and pneumocystis pneumonia among homosexual men-New York City and California. *MMWR: Morbidity & Mortality Weekly Report*, *25*, 305-308.

Centers for Disease Control and Prevention. (2001). HIV incidence among young men who have sex with men - seven U.S. cities. *MMWR: Morbidity & Mortality Weekly Report*, *50*, 440-445.

Centers for Disease Control and Prevention. (2002). Unrecognized HIV infection, risk behaviors, and perceptions of risk among young black men who have sex with men-six U.S. cities, 1994-1998. *MMWR: Morbidity & Mortality Weekly Report*, *51*, 733-736.

Centers for Disease Control. *HIV/AIDS Surveillance Report, 2003 (Vol. 15)*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *2004*, 1-46.

Centers for Disease Control and Prevention (2005). HIV/AIDS surveillance report. US Department of Health and Human Services Public Health Service: Atlanta, Georgia.

Chaisson, R., Moss, A., Onishi, R., Osmond, D. & Carlson, J. (1987). Human immunodeficiency virus infection in heterosexual intravenous drug users in San Francisco. *American journal of Public Health*, *77*, 169-172.

Chuang, E., Jason, G., & Pajurkova, E (1992). Psychiatric morbidity in patients with HIV infection. *Canadian Journal of Psychiatry*, *37*, 109-115.

Collins, J.L. (1984). *Self-efficacy and ability in achievement behavior.* Unpublished doctoral dissertation, Stanford University.

Cook, J., Cohen, M., Burke, J., Grey, D., Anastos, K., Kirstein, L., Palacia, H., Richardson, J., Wilson, T., & Young, M. (2002a). Effects of depressive symptoms and mental health quality of life on use of highly active antiretroviral therapy among HIV-seropositive women. *Journal of Acquired Immune Deficiency Syndromes*, *30*, 401-409.

Corbett, H. & Wilson, B. (1991). What is the system in systemic reform? *Educational researcher*, *24*, 11-17.

Cote, T., Biggar, R., & Dannenberg, A. (1992). Risk of suicide among persons with AIDS: A national assessment. The *Journal of American Medical Association*, *268*, 2066-2068.

Cotton, K. & Wikelund, K. (1989). Parent involvement in education. School Improvement Research Series [Online]. Available: http://www.nwrel.org/scpd/sirs/3/cu6.html.

Crawford, J., Besson, J., & Bremner, M. (1992). Estimation of premorbid intelligence in schizophrenia. *Journal of Psychiatry*, *161*, 69-74.

D'Ailly, H. (1992). Asian mathematics superiority: A search for explanations: Errata. *Educational Psychologist*, *27*, 405.

Darling-Hammond, L. (1998). Teacher learning that supports student learning. *Educational Leadership*, *55*, 6-11.

Davis, P. & Magnuson (2004). "The influence of parental education on child development," mimeo, University of Michigan, 2004.

Department of Education, Washington, D.C. (1999). Educational Excellence for All Children Act of 1999: An overview of the Clinton Administration's Proposal to reauthorize the Elementary and Secondary Education Act.

Deshon, R., Smith, M., Chan, D., & Schmitt, N. (1998). Can racial differences in cognitive test performance be reduced by presenting problems in a social context? *Journal of Applied Psychology*, *83*, 438-451.

Dickey, W., Dew, M., Becker, J., & Kingsley, L. (1999). Combined effects of HIV-infection status and psychosocially vulnerability on mental health in homosexual men. *Social Psychiatry and Psychiatric Epidemiology*, *34*, 4-11.

Diehr M.C., Cherner M., Wolfson T.J., Miller S.W., Grant I., Heaton R.K. & the HIV Neurobehavioral Research Center Group. (2003). The 50 and 100-item short forms of Paced Auditory Serial Addition Task (PASAT): demographically corrected norms and comparisons with the full PASAT in normal and clinical samples. *Journal of Clinical Experimental Neuropsychology*, *25*, 571-85.

Duncan, G. & Magnuson (2005). Can family socioeconomic resources account for Racial and ethnic test score gaps? The Future of Children, 15, 35-53.

Dunkel-Schetter, C. & Bennett, T. (1990). Differentiating the cognitive and behavioral aspects of social support. In B.R. Sarason, I.G. Sarason, & G.R. Pierce, (Eds.), *Social support: An interactive view*. New York: Wiley.

Epstein, J. (1987). Effects of student achievement on teachers' practices of parental involvement. In S. Silvern (Ed.), *Literacy though family, community, and school interaction*. Greenwich, CT: JAI Press.

Evans, J., Miller, S., Byrd, D., & Heaton, R. (2000). Cross-cultural applications of the Halstead-Reitan Batteries. In E. Fletcher, T. Strickland, C. Reynolds (Eds.), *Handbook of cross-cultural neuropsychology*. Dordrecht, Netherlands: Kluwer Academic Publishers.

Evans, C., Stewart, P., Mangin, M., & Bagley, C. (2001). Teacher quality: Issues and Research. *Education*, *122*, 200-205.

Fauci, A., Macher, A., Longo, D., Lane, H., Rook, A., Masur, H., et al. (1984). Acquired immunodeficiency syndrome: Epidemiologic, clinical, immunologic, and therapeutic considerations. *Annals of Internal Medicine*, *100*, 92-106.

Fehrmann, P., Keith, T., & Reimers, T. (1987). Home influence on school learning: Direct and indirect effects of parent involvement on high school grades. *The Journal of Educational Research*, *80*, 330-337.

Friedman, S., Des Jarlais, D., Sotheran, J., Garberm J., Cohen, H. & Smith, D. (1987). AIDS and self-organization among intravenous drug users. *The International Journal of the Addictions*, *22*, 201-219.

Gala, C., Pergami, A., Catalan, J., Durbano, F., Musicco, M., Riccio, M., Baldeweg, T., & Invernizzi, G. (1993). The psychosocial impact of HIV infection in gay men, drug users, and heterosexuals: Controlled investigation. *British Journal of Psychiatry*, *163*, 651-659.

Gladsjo J.A., Schuman, C.C., Evans, J.D., Peavy G.M., Miller S.W., & Heaton R.K. (1999). Norms for letter and category fluency: Demographic corrections for age, education, and ethnicity. *Assessment*, *6*, 147-178.

Glasner, P. & Kaslow, R. (1990). The epidemiology of human immunodeficiency virus infection. *Journal of Consulting and Clinical Psychology*, *58*, 13-21.

Glass, J., Fedor, H., Wesselingh, S. & McArthur, J. (1995). Immunocytochemical quantitation of human immunodeficiency virus in the brain: Correlations with dementia. *Annals of neurology*, *38*, 755-762.

Grant, I., Atkinson, J., Hesselink, J., Kennedy, C., Richman, D., Spector, S., & McCutchan, J. (1987). Evidence for early central nervous system involvement in the acquired immunodeficiency syndrome (AIDS) and other human immunodeficiency virus (HIV) infections. *Annals of Internal Medicine, 107*, 828 – 836.

Grant, I., Heaton, R., Atkinson, J., & the HNRC Group (1995). Neurocognitive disorder in HIV-1 infection. In MBA Oldstone & L. Vitkovic (Eds.) *Current topics in microbiology and immunology HIV and dementia* (pp. 9-30). Heidelberg, Germany: Springer Veriag.

Grant, I., Marcotte, T., Heaton, R., & the HNRC Group (1999). Neurocognitive complications of HIV disease. *Psychological Science*, *10*, 191-195.

Griffith, J. (1998). The relation of school structure and social environment to parent involvement in elementary schools. *The Elementary School Journal*, *99*, 53-79.

Grolnick, W., Benjet, C., Kurowski, C., & Apostoleris, N. (1997). Predictors of Parent Involvement in Children's Schooling. *Journal of Educational Psychology, 89*, 538 - 548.

Grolnick, W., & Slowiaczek, M. (1994) Parents' Involvement in Children's Schooling: A Multidimensional Conceptualization and Motivational Model. *Child Development, 65*, 237 - 252.

Gurung, R., Taylor, S., Kemeny, M., & Myers, H. (2004). HIV is not my biggest problem: The impact of HIV and chronic burden on depression in women at risk for AIDS. *Journal of Social and Clinical Psychology, 23*, 490-511.

Heaton, R.K., Chelune, G. & Lehman, R. (1978). Using neuropsychological and personality tests to assess the likelihood of patient employment. *The Journal of Nervous and Mental Disease*, *166,* 408-416.

Heaton, R.K., Grant, I., Butters, N., White, D., Kirson, Atkinson , H., McCutchan, A., Taylor, M., Kelly, M., Ellis, R., Wolfson, T., Velin, R., Marcotte, T., Hesselink, J., Jernigan, T., Chandler, J., Wallace, M., Abramson, I. & the HNRC Group (1995). The HNRC 500 – Neuropsychology of HIV infection at different disease stages. *Journal of the International Neuropsychological Society*, *1*, 231-251.

Heaton, R.K., Grant, I., & Matthews, C.G. (1991). *Comprehensive Norms for an Expanded Halstead-Reitan Battery: Demographic Corrections, Research Findings, and Clinical Applications*. Odessa, FL: Psychological Assessment Resources.

Heaton, R.K., Marcotte, T.D., Rivera-Mindt, M., Sadek, J., Moore, D.J., Bentley, H., McCutchan, J.A., Reicks, C., Grant, I., & the HNRC Group, (2004). The impact of HIV-associated neuropsychological impairment on everyday functioning. *Journal of International Neuropsychological Society,10,* 317-331.

Heaton, R.K. & Pendleton, M. (1981). Use of neuropsychological tests to predict adult patients' everyday functioning. *Journal of Consulting and Clinical Psychology*, *49*, 807-821.

Heaton, R.K., Ryan, L., Grant, I., & Matthews, C. (1996). Demographic influences on neuropsychological test performance. In I. Grant & A. Kenneth (Eds.)

Neuropsychological assessment of neuropsychiatric disorders (2nd ed.). New York, NY: Oxford University Press.

Heaton, R. K., Taylor, M., & Manly J. (2001). Demographic effects and demographically corrected norms with the WAIS-III and WMS-III. In D.Tulsky, R. K. Heaton, G. J. Chelune, I. Ivnik, R. A. Bornstein, A. Prifitera, & M. Ledbetter (Eds.), *Clinical Interpretations of the WAIS-III and WMS-III* (pp. 181-210). San Diego, CA : Academic Press.

Heaton, R.K., Velin, R., McCutchan, A., Gulevich, S., Atkinson, H., Wallace, M., Godfrey, H., Kirson, D., Grant, I. & the HNRC Group (1993). Neuropsychological impairment in human immunodeficiency virus-infection: Implications for employment. *Psychosomatic Medicine*, *56*, 8-17.

Helms, J. (1992). Why is there no study of cultural equivalence in standardized cognitive ability testing? *American Psychologist*, *47*, 1083-1101.

Hinkin, C., Hardy, D., Mason, K., Castellon, S., Lam, M., Stefaniak, M., et al. (2002). Verbal and spatial working memory performance among HIV-infected adults. *Journal of the International Neuropsychological Society*, *8*, 532-538.

Hoffman, M (1997). HIV disease and work: Effect on the individual, workplace, and interpersonal contexts. *Journal of Vocational Behavior*, *51*, 163-201.

Hoover, D., Saah, A., Bacellar, H., Detes, R., & Phair, J. (1992). The progression of untreated HIV-1 infection prior to AIDS. *American Journal of Public Health*, *82*, 1538-1541.

Hoover-Dempsey, K., & Sandler, H. 1995. Parent Involvement in Children's Education: Why Does It Make a Difference? *Teachers College Record, 97*, 310 - 331.

Hoover-Dempsey, K., & Sandler, H. 1997. Why Do Parents Become Involved in Their Children's Education? *Review of Educational Research, 67*, 3 - 42.

House, J., Umberson, D., & Landis, K. (1988). Structures and processes of social support. *Annual Review of Sociology*, *14*, 293-318.

Ickovics, J., Druley, H., Morrill, A, Grigorenko, E., & Rodin, J. (1998). "A grief observed": The experience of HIV-related illness and death among women in a clinic-based sample in New Haven, Connecticut. *Journal of Consulting and Clinical Psychology*, *66*, 958-966.

Jacobs, D., Sano, M., Albert, S., Schofield, P., Dooneief, G. & Stern, Y. (1997). Cross-cultural neuropsychological assessment: A comparison of randomly selected, demographically matched cohorts of English- and Spanish-speaking older adults. *Journal of Clinical & Experimental Neuropsychology*, *19*, 331-339.

Janssen, R., Cornblath, D. & Epstein, L. (1991). Nomenclature and research case definitions for neurologic manifestations of human immunodeficiency virus-type 1 (HIV-1) infection. *Neurology*, *41*, 778-785.

Jenkins, R. & Coons, H. (1996). Psychosocial stress and adaptation processes for women coping with HIV/AIDS. In A. O'Leary & L. Jemmott (Eds.), *Woman and AIDS: Coping and care.* New York: Plenum Press.

Johnstone, B., Hexum, C. L., & Ashkanazi, G. (1995). Extent of cognitive decline in traumatic brain injury based on estimates of premorbid intelligence. *Brain Injury*, 9, 377-384.

Kaplan, J. & Bennett, T. (2003). Use of race and ethnicity in biomedical publication. *Journal of the American Medical Association*, *289,* 2709-2716.

Kaplan, E., Goodglass, H., Weintraub, S. (1983). *Boston Naming Test*. Philadelphia: Lea & Febinger, 1983.

Kaufman, A., McLean, J. & Reynolds, C. (1988). Sex, race, residence, region, and education differences on the 11 WAIS-R subtests. *Journal of Clinical Psychology*, *44*, 231-248.

Kermani, E., Borod, J., Brown, P. & Tunnell, G. (1985). New psychopathologic findings in AIDS: Case Report. *The Journal of Clinical Psychiatry*, *46*, 240-241.

Kirsch, I. (1982). Efficacy expectations or response predictions: The meaning of efficacy ratings as a function of task characteristics. *Journal of Personality and Social Psychology*, *42*, 132-136.

Kirsch, I., Jungeblut, A., Jenkins, L., & Kolstad, A. (1993). Adult literacy in America: The National Sdult Literacy Survey. National Center for Education Statistics, US Department of Education. Washington DC: US Government Printing Office.

Kongs S.K., Thompson L.L., Iverson G.L., Heaton R.K. (2002). *Wisconsin Card Sorting Test-64 Card Computerized Version*. Odessa, Florida: Psychological Assessment Resources.

Koutsilieri, E., Scheller, C. Sopper, S., Meulen, V., & Riederer, P. (2002). Psychiatric complications in human immunodeficiency virus infection. *Journal of NeuroVirology*, *8*, 129-133.

Kral, A., Bluthenthal, J., Lorvick, J., Gee, L., Bacchetti, P. & Edin, B. (2001). Sexual transmission of HIV-1 among injection drug users in San Francisco, USA: risk-factor analysis. *Lancet, 357,* 1397-140

Laosa, L. (1983). School, occupation, culture, and family; The impact of parental schooling on the parent child relationship. In Sigel, I.E. and Laosa, L (Ed.), Changing Families (pp. 79-135). New York, NY: Plenum.

La Rue, A., Romero, L., Ortiz, I., Liang, H.C., Lindeman, R. (1999). Neuropsychological performance of Hispanic and non-Hispanic older adults: An epidemiologic survey. *The Clinical Neuropsychologist*, *13*, 474-486.

Letenneur, L., Commenges, D., Dartigues, J.F., & Barberger-Gateau, P. (1994). Incidence of dementia and Alzheimer's disease in elderly community residents of south-western France. *International Journal of Epidemiology*, *23*, 1256–1261.

Levin, B., Berger, J., Didona, T. & Duncan, R. (1992). Cognitive function in asymptomatic HIV-1infection: The effects of age, education, ethnicity, and depression. *Neuropsychology*, *6*, 303-313.

Levy, J., Shimabukuro, J., Hollander, H., Mills, J. & Kaminsky, L. (1985). Isolation of AIDS-associated retroviruses from cerebrospinal fluid and brain of patients with neurological symptoms. *Lancet*, *2*, 586-588.

Lezak, M. Neuropsychological Assessment, (3rd Ed.). (1995). New York: Oxford University Press.

Lichtenberg, P., Ross, T. & Christensen, B. (1994). Preliminary normative data on the Boston Naming Test for an older urban population. *Clinical Neuropsychologist*, *8*, 109-111.

Linn, R. (1999). Standards-based accountability: Ten suggestions (CRESST Policy Brief). Los Angeles: National Center for Research on Evaluation, Standards and Student Testing.

Loewenstein, D.A., Arguelles, T., Arguelles, S., & Linn-Fuentas, P. (1994). Potential cultural bias in the neuropsychological assessment of the older adult. *Journal of Clinical and Experimental Neuropsychology*, *16*, 623-629.

Loewenstain, D.A., Arguelles, t., Barker, W., & Duara, R. (1993). A comparative analysis of neuropsychological test performance of Spanish-speaking and English-speaking patients with Alzheimer's disease. *Journals of Gerontology*, *48*, 142-149.

Loewenstein, D.A., Duara, R., Arguelles, T., & Arguelles, S. (1995). Use of the Fuld Object-Memory Evaluation in the detection of mild dementia among Spanish-and English-speaking groups. *American Journal of Geriatric Psychiatry*, *3*, 300-307.

Lopez, S. & Taussig, M. (1991). Cognitive-intellectual functioning of Spanish-speaking impaired and nonimpaired elderly: Implications for culturally sensitive assessment. *Psychological Assessment*, *3*, 448-454.

Lucas J.A. , Ivnik R.J. , Smith G.E. , Ferman T.J. , Willis F.B. , Petersen R.C. , Graff-Radford N.R (2005). Mayo's Older African Americans Normative Studies: norms for Boston Naming Test, Controlled Oral Word Association, Category Fluency, Animal Naming, Token Test, Wrat-3 Reading, Trail Making Test, Stroop Test, and Judgment of Line Orientation. *Clinical Neuropsychologist*, *19*, 243-269.

Lyketsos, C. & Federman, F. (1995). Psychiatric disorders and HIV infection: Impact on one another. *Epidemiologic Reviews*, *17*, 152-164.

Lyketsos, C., Hanson, A., Fishman, M., McHugh, P., & Treisman, G. (1994). Screening for psychiatric disorders in an HIV medial clinic: The importance of a psychiatric presence. *International Journal of Psychiatry and Medicine*, *24*, 103-113.

Lyketsos, C., Hoover, D., Guccione, M., Dew, M., Wesch, J., Bing, E., & Treisman, G. (1996). Depressive symptoms over the course of HIV infection before AIDS. *Social Psychiatry and Psychiatric Epidemiology*, *31*, 212-219.

Lynn, R. (1996). Racial and ethnic differences in intelligence in the US on the Differential Ability Scale. *Personality and Individual Differences*, *20*, 271.

Maddux, J.E., Norton, L.W., & Stoltenberg, C.D. (1986). Self-efficacy expectancy, outcome expectancy, and outcome value: Relative effects on behavioral intentions. *Journal of Personality and Social Psychology*, *51*, 783-789.

Magnuson, K. (2003). The effects of increases in welfare mothers' education on their young children's academic and behavioral outcomes: Evidence from the National Evaluation of Welfare-to-Work Strategies Child Outcomes study. Istitute for Research on Poverty Discussion Paper. Unversity of Wisconsin, 1274-1303.

Maj, M., Janssen, R., Starace, F., Zaudig, M., Satz, P., Sughondhabirom, B., Luabeya, M., Riedel, R., Ndetei, D., & Calil, H. (1994). WHO neuropsychiatric AIDS study, cross-sectional phase I: Study design and psychiatric findings. *Archives of General Psychaitry*, *51*, 39-49.

Manly, J. (2005). Advantages and disadvantages of separate norms for African Americans. *Clinical Neuropsychologist, 19*, 270-275.

Manly, J., Jacobs, D.M., Sano, M., Bell, K., Merchant, C.A., Small, S.A., & Stern, Y. (1998a). African American acculturation and neuropsychological test performance among nondemented community elders. *Journal of the International Neuropsychological Society, 4*, 77.

Manly, J.J., Jacobs, D.M., Sano, M., Bell, K., Merchant, C.A., Small, S.A., & Stern, Y. (1998b). Cognitive test performance among nondemented elderly African Americans and Whites. *Neurology*, *50*, 1238-1245.

Manly, J., Jacobs, D., Touradji, P., Small, S., & Stern, Y. (2002). Reading level attenuates differences in neuropsychological test performance between African American and White elders. *Journal of the International* Neuropsychological *Society*, *8*, 341-348.

Manly, J., Schupf, N., Tang, M. (2005). Cognitive decline and literacy among ethnically diverse elders. *Journal of Geriatric Psychiatry and neurology*, *18*, 213-217.

Manly, J., Touradji, P., Tang, M & Stern, Y. (2003). Literacy and memory decline among ethnically diverse elders. *Journal of Clinical and Experimental Neuropsychology*, *25*, 680-690.

Marcopulos, B., McLain, C., & Giuliano, A. (1997). Cognitive impairment or inadequate norms: A study of healthy, rural, older adults with limited education. *Clinical Neuropsychologist*, *11*, 111-131.

Marcotte, T.D., Heaton, R.K., Wolfson, T., Taylor, M.J., Alhassoon, O., Arfaa, K., Grant, I., & the HNRC Group (1999). The impact of HIV-related neuropsychological dysfunction on driving behavior. *Journal of the International Neuropsychological Society,* 7, 579-592.

Marlowe, B.A. & Page, M.L. (1998). *Creating and sustaining the constructivist classroom*. Thousand Oaks, CA: Corwin Press, Inc.

Martin, E., Pitrak, D., Pursell, K., Andersen, B., Mullane, K. & Novak, R. (1998). Information processing and antiretroviral therapy in HIV-1 infection. *Journal of the International Neuropsychological Society*, *4*, 329-335.

Martin, E., Sullivan, T., Reed, R., Fletcher, T., Pitrak, D., Weddingon, W., Harrow, M. (2001). Auditory working memory in HIV-infection. *Journal of the International Neuropsychological Society*, *7*, 20-26.

Mason, K. Campbell, A., Hawkins, P., Madhere, S., Johnson, K, and Takushi-Chinen, R. (1998). Neuropsychological functioning in HIV-positive African-American women with a history of drug use. *Journal of the American Medical Association*, *90*, 665-674.

McAllister, R., Herns M., Harrison, M., Newman, S., Connolly, S., Fowler, C., Fell, M., Durrance, P., Manji, H., Kendall, B. et al. (1992). Neurological and neuropsychological performance in HIV seropositive men without symptoms. *Journal of neurology, neurosurgery, and psychiatry*, *55*, 143-148.

McArthur, J., Cohen, B., Selnes, O., Kumar, A., Cooper, K., McArthur, J. et al. (1989). Low prevalence of neurological and neuropsychological abnormalities in otherwise healthy HIV-1-infected individuals: Results from the Multicenter AIDS Cohort Study. *Annuals of Neurology*, *26*, 601-611.

McArthur, J., Haughey, N., Gartner, S., Conant, K., Pardo, C., Nath, A. & Sacktor, N. (2003). Human immunodeficiency virus-associated dementia: an evolving disease. *Journal of Neurovirology*, *9*, 205-221.

McGonagle, K & Kessler, R. (1990). Chronic stress, acute stress, and depressive symptoms. *American Journal of Community Psychology*, *18*, 681-706.

Miller, E., Bing, E., Selnes, O., Wesch, J. & Becker, J. (1993). The effects of sociodemographic factors on reaction time and speed of information processing. *Journal of Clinical & Experimental Neuropsychology*, *15*, 66.

Miller, S., Heaton, R., Kirson, D. & Grant, I. (1997). Neuropsychological (NP) assessment of African Americans. *Journal of the International Neuropsychological Society*, 3, 49.

Molitor, F., Ruiz, J., Flynn, N., Mikanda, J., Sun, R., Anderson, R. (1999). Methamphetamine use and sexual and injection risk behaviors among out-of-treatment injection drug users. *American Journal of Drug and Alcohol Abuse*, *25*, 475-493.

Monzon, O. & Capellan, J. (1987). Female-to-female transmission of HIV. *Lancet*, *2*, 40-41.

Moos, R. & Schaefer, J. (1993). Coping resources and processes: Current concepts and measures. In L. Goldberger & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects* (pp.377-401). New York: Free Press.

Morris, M. & Kretzschmar, M. (1997). Concurrent partnerships and the spread of HIV. *AIDS*, *11*, 641-648.

Navia, B., Jordan, B., & Price, R. (1986a). The AIDS dementia complex: I. Clinical features. *Annals of Neurology*, *19*, 517-524.

Navia, B., Cho, E., Petito, C. & Price, R. (1986b). The AIDS dementia complex: II. Neuropathology. *Annals of Neurology*, *19*, 525-535.

Norman, M., Evans, J., Miller, W., & Heaton, R. (2000). Demographically corrected norms for the California Verbal Learning Test. *The Journal of Clinical and Experimental Neuropsychology*, *22*, 80-94.

Nunnaly, J. (1978). *Psychometric theory*. New York: McGraw-Hill.

O'Bryant, S., O'Jile, & McCaffrey, R. (2004). Reporting of demographic variables in neuropsychological research: trends in the current literature. *The Clinical Neuropsychologist*, *18*, 229-233.

O'Bryant, S., Schrimsher, G. & O'Jile, J. (2005). Discrepancies between self-reported years of education and estimated reading level: potential implications for neuropsychologists. *Applied Neuropsychology*, *12*, 5-11.

O'Dowd, M., Biderman, D., & McKegney, F. (1993). Incidence of suicidality in AIDS and HIV-positive patients attending a psychiatry outpatient program. *Psychosomatics*, *34*, 33-40.

Overmier, J.B. & lawry, J.A. (1979). Conditioning and the mediation of behavior. In G.H. Bower (ed.), *The psychology of learning and motivation* (pp. 1-55). New York: Academic Press.

Pate-Bain, H., Fulton, B.D., & Boyd-Zaharias, J. (1999). Effects of Class-Size Reduction in the Early Grades (k-3) on High School Performance Preliminary Results from Project STAR, Tennessee's Longitudinal Class-Size Study.

Patton, D., Duff, K., Schoenberg, M., Mold, J., Scott, J. & Adams, R. (2003). Performance of cognitively normal African Americans on the RBANS in community dwelling older adults. *The Clinical Neuropsychologist*, *17*, 515-530.

Perry, V., Lawson, L., & Reid, D. (1994). Biology of the mononuclear phagocyte system of the central nervous system and HIV infection. *Journal of Leukocyte Biology*, *3*, 399-406.

Pintrich, P. & Schrauben, B. (1992). Students' motivational beliefs and their cognitive engagement in classroom academic tasks. In D. Schunk & J. Meece (Eds.), *Students perceptions in the classroom: Causes and consequences* (pp.149-183). Hillsdale, NJ: Erlbaum.

Popham, W.J. (1999). Why standardized tests don't measure educational quality. *Educational Leadership*, *57*, 8-15.

Pritchard, I. (1999). *Reducing class size: What do we know?* Washington, D.C: U.S. Department of Education.

Repetti, R (1993). The effects of workload and the social environment at work on health. In L. Goldberger, & S. Breznitz (Eds.), *Handbook of stress: Theoretical and clinical aspects (pp. 368 – 385).* New York, Free Press.

Reynolds, C., Chastain, R., Kaufman, A. & McLean, J. (1987). Demographic characteristics and IQ among adults: Analysis of the WAIS-R standardization sample as a function of the stratification variables. *Journal of School Psychology*, *25*, 323-342.

Rhodes, T., Stimson, G. & Quirk, A. (1996). Sex, drugs, intervention, and research: from the individual to the social. *Sustance Use and Misuse*, *31*, 375-407.

Richardson, J., Martin, E., Jimenez, N., Danley, K., Cohen, M., Carson, V., et al., (2002). Neuropsychological functioning in a cohort of HIV infected women: importance of

antiretroviral therapy. *Journal of the International Neuropsychological Society*, *8*, 781-793.

Roberts, R. & Hamsher, K. (1984). Effects of minority status on facial recognition and naming performance. *Journal of Clinical Psychology*, *40*, 539-545.

Roselli, M. & Ardila, A. (1991). Effects of age, education, and gender on the Rey-Psterrieth Complex Figure. *The Clinical Neuropsychologist*, *5*, 370-376.

Rosenberg, P. & Biggar, R. (1998). Trends in HIV incidence among young adults in the United States. *Journal of the American Medical Association*, *279*, 1894-1899.

Rosenberger, P., Bornstein, R., & Nasrallah, H. (1993). Psychopathology in HIV infection: Lifetime and current assessment. *Comprehensive Psychiatry*, *34*, 150-158.

Rothenberg, R., Scarlett, M., del Rio, C., Reznick, D. & O'Daniels, C. (1998). Oral transmission of HIV. *AIDS*, *12*, 2095-2105.

Ryan, E., Baird, R., Rivera-Mindt, M., Byrd, D., Monzones, J., Morgello, S., & the Manhattan HIV Brain Bank (2005). Neuropsychological Impairment in Racial/Ethnic Minorities with HIV Infection and Low Literacy Levels: Effects of Education and Reading Level in Participant Characterization. *Journal of the International Neuropsychological Society*, *11*, 889-898.

Sacktor, N., McDermott, M., Marder, K., Schifitto, G., Selnes, O., McArthur, J., et al., (2002). HIV-associated cognitive impairment before and after the advent of combination therapy. *Journal of Neurovirology*, *8*, 136-142.

Sarngadharan, M., DeVico, A., Bruch, L., Schpbach, J. & Gallo, R. (1984). HTLV-III: The etiologic agent of AIDS. *Princess TakamatsuSsymposia*, *15*, 301-308.

Schunk, D.H. (1984). Self-efficacy perspective on achievement behavior. *Educational Psychologist*, *19*, 48-58.

Schunk, D. (1989). Self-efficacy and cognitive skill learning. In C. Ames & R. Ames (Eds.), *Research on motivation in education*. Goals and cognitions. (pp.13-44). San Diego: Academic Press.

Schunk, D.H. & Zimmerman, B.J. (1998a). *Self-regulation of learning and performance: Issues and educational applications*. Hillsdale, NJ: Erlbaum.

Schunk, D.H. & Zimmerman, B.J. (1998b). *Self-regulated learning: From teaching to self-reflective practice*. New York: Guilford.

Segerstrom, S., Taylor, S., Kemeny, M., & Fahey, J. (1998). Optimism is associated with mood, coping and immune change in response to stress. *Journal of Personality and Social Psychology*, *74*, 1646-1655.

Sewell, D., Jeste, D., Atkinson, J., Heaton, R., Hesselink, J., Wiley, C., et al., (1994). HIV-associated psychosis: a study of 20 cases. San Diego HIV Neurobehavioral Research Center Group. *American Journal of Psychiatry*, *151*, 237-242.

Somlai, A., Kelly, J., McAuliffe, T., Ksobiech, K., & Hackl, K. (2003). Predictors of HIV sexual risk behaviors in a community sample of injection drug-using men and women. *AIDS and Behavior*, *4*, 383-393.

Spreen, O. & Strauss, E. (1988). *A Compendium of Neuropsychological Tests: Administration, Norms and Commentary*, 2nd Ed. Oxford: Oxford University Press.

Stern Y., Andrews H. Pittman J., Sano M., Tatemichi T., Lantigua R., & Mayeux R. (1992). Diagnosis of dementia of in a heterogeneous population. Development of a

neuropsychological paradigm-based diagnosis of dementia and quantified correction for the effects of education. *Archives of Neurology*, *49*, 453-460.

Stern, Y. (2002). What is cognitive reserve? Theory and research application of the reserve concept. *Journal of the International Neuropsychological Society*, *8*, 448-460.

Stern, Y., Gurland, B., Tatemichi, T.K., Tang, M.X., Wilder, D., & Mayeux, R. (1994). Influence of education and occupation on the incidence of Alzheimer's disease. *Journal of the American Medical Association*, *271*, 1004–1010.

Stevenson, D. & Baker, D. (1987). The family-school relation and the child's school performance. *Child Development*, *58*, 1348-1357.

Stover, D. (1999). The least qualified teach the most needy: Working to fix it. *The Education Digest*, *64*, 40-44.

Strathdee, S., Galai, N., Safaiean, M., Celentano, D., Vlahov, D., Johnson, L. et al., (2001). Sex differences in risk factors for HIV seroconversion among injection drug users: A 10-year perspective. *Archives of Internal Medicine*, *161*, 1281-1288.

Sui-Chi, E. & Willms, J. (1996). Effects of parent involvement on eighth-grade achievement. *Sociology of Education*, *69*, 126-141.

Tang M.X., Cross P., Andrews H., Jacobs D.M., Small S., Bell K., Merchant C., Lantigua R., Costa R., Stern Y., Mayeux R. (2001). Incidence of AD in African-Americans, Caribbean Hispanics, and Caucasians in northern Manhattan. *Neurology*, *56*, 49-56.

Taussig, I.M., Henderson, V.W., & Mack, W. (1992). Spanish translation and validation of a neuropsychological battery: Performance of Spanish- and English-speaking

Alzheimer's disease patients and normal comparison subjects. *Clinical Gerontologist*, *2*, 95-108.

The Education Trust (2000). Honor in the boxcar: Equalizing teacher quality. *Thinking K-16*, *4*, 1-2.

Tuckman, B.W. (1990). Group versus goal-setting effects on the self-regulated performance of students differing in self-efficacy. *Journal of Experimental Education*, *58*, 291-298.

Tulsky, D & Price, L. (2002). Cross validation of the joint factor structure of the WAIS-III and WMS-III: Examination of the structure by ethnic and age groups. In D. Tulsky, D. Saklofske, R.K. Heaton, G. Chelune, R. Ivnik, R.A. Bornstein, A. Prifitera & M. Ledbetter (Eds.) *Clinical Interpretation of the WAIS-III and WMS-III*. San Diego, CA: Academic Press.

Unvergazt, F., Hall, K., Torke A., Redigar, J., Mercado, N., Gureje, O., Osuntokon, B., & Hendrie, H. (1996). Effects of age, education, and gender on CERAD neuropsychological test performance in an African-American sample. *The Clinical Neuropsychologist*, *10*, 180-190.

Vogt, M., Witt, D., Craven, D., Byington, R., Crawford, D., Schoolet, R., et al., (1986). Isolation of HTLV-III/LAV from cervical secretions of women at risk for AIDS. *Lancet, 1,* 525 - 527.

Watters, J. (1994). Trends in risk behaviors and HIV seroprevalence in heterosexual injection drug users in San Francisco. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*, *7*, 1276-1281.

Wechsler, D. (1997). *Wechsler Adult Intelligence Test-3rd Edition (WAIS-III)*. The Psychological Corporation: San Antonio, Texas.

Weinbrack, P., Loustaud, V., Denis, F. & Liozon, F. (1988). Breast feeding and HIV1 transmission. Abstract. Paper presented at the Fourth International Conference on the Acquired Immunodeficiency Syndrome, Stockholm, Sweden.

Weiss, R. (2000). Getting to know HIV. *Tropical Medicine and International Health*, *5*, A10-A15.

Wells, K., Stewart, A., Hays, R., Burnam, M., Rogers, W., Daniels, M., Berry, S., Greenfield, S., & Ware, J. (1989). The functioning and well-being of depressed patients. *Journal of American Medical Association*, *262*, 914-919.

Welsh, K., Fillenbaum, G., Wilkinson, W., Heyman, A., Mohs, R., Stern, Y., et al. (1995). Neuropsychological test performance in African-American and white patients with Alzheimer's disease. *Neurology*, *45*, 2207-2211.

White, K (1982). The relationship between socioeconomic status and academic achievement. *Psychological Bulletin*, *91*, 461- 481.

Wilkinson, G. (1993). *Wide Range Achievement Test (3rd ed.) Administration Manual*. Delaware: Wide Range Inc.

Wolk, R. (1998). Education's high-stakes gamble. *Education Week, 18 (15)*: 48.

Woods, S., Rippeth, J., Frol, A., Levy, J., Ryan, E., Soukup, V., et al. (2004). Interrater reliability of clinical ratings and neurocognitive diagnoses in HIV. *Journal of Clinical and Experimental Neuropsychology*, *26*, 759-778.

Zimmerman, B.J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *81*, 329-339.

Zimmerman, B.J. (1990). Self-regulated academic learning and achievement: The emergence of a social cognitive perspective. *Educational Psychology Review*, *2*, 173-201.

Zimmerman, B.J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist*, *33*, 73-86.

Zimmerman, B.M. & Martinez-Pons, M (1988). Construct validation of a strategy model of student self-regulated learning. *Journal of Educational Psychology*, *80*, 284-290.