

ABSTRACT

Title of thesis: THE ASSOCIATION BETWEEN LITERACY
AND WORK PERFORMANCE AS
MEDIATED BY DEPRESSION

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Approximately 90 million Americans are functionally illiterate, meaning that they cannot accomplish basic tasks such as interpreting a bus schedule or filling in an order form (Lincoln et al., 2008). Low levels of literacy have been associated with poor health outcomes, including anxiety and depression, in addition to poor work performance. This study examined the possible mediating role of depression in the association between literacy and work performance, using a nationally representative sample of young adults from the National Longitudinal Survey of Youth - 1997. The results indicated that after controlling for race and gender there was a significant association between emotional distress and the degree to which emotional problems limited work performance. The trend toward an association between literacy and the degree to which emotional distress affects work did not hold once race and sex were controlled. Suggestions are provided for future research that can more thoroughly test the effects of literacy on work performance.

THE ASSOCIATION BETWEEN LITERACY AND WORK PERFORMANCE AS
MEDIATED BY DEPRESSION

by

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Chapter 1: Introduction

Statement of the Problem

Mental health challenges of employees, particularly depression, have deep implications for workplace productivity. In one study of a nationally representative sample, 18% of American employees reported experiencing at least one symptom of a mental disorder during the past month (Harvard Mental Health Letter, 2010). According to the World Health Organization, depression is the mostly costly health condition for employers, and anxiety is the fifth most costly, with the third, fourth, and fifth being obesity, arthritis, and back and neck pain (Harvard Mental Health Letter, 2010). Not only does depression cause loss in productivity due to days missed at work, but mental health disorders also contribute to “presenteeism,” or employees not working at full capacity when they are on the job. Wright, Bonnet and Sweeny (1993) were the first to find that the state of mental health is a reliable predictor of individuals’ subsequent work performance.

Depression not only causes lost productivity; it is in turn exacerbated by negative working conditions. Numerous studies have been conducted on the association between working conditions, particularly level of stress, and workers’ subjective well-being, including their levels of depression, anxiety, and job satisfaction. Most studies have found a moderate correlation between intensity of work stressors and indices of employee mental health (e.g., Lee & Ashforth, 1996; Nixon, Mazzola, Bauer, Krueger, & Spector, 2011). In addition, job satisfaction has been linked to overall positive job performance (Judge, Thoresen, Bono, & Patton, 2001), so negative job conditions that lead to lower job satisfaction also pose a risk for employees’ poorer job functioning.

Another factor contributing to poor work performance is employees' level of literacy ability. Workinger and Ruch (1991) stated that the problem of poor literacy skills is "sizeable in scope" and "significantly affects the competitiveness of American business and industries in a global economy" (p. 251). Cappelli and Rogovsky (1995) found that employees considered foundational skills, those associated with traditional schooling, to be more important in facilitating their work performance than specific job based competencies. In the same study, supervisor rankings of the relative importance of types of skills were almost identical to those of their employees. Unfortunately there has been little research on the relationship between literacy and job performance, although there have been many studies examining the best methods for implementing a workplace literacy program.

Poor literacy skills have also been linked to overall poorer mental and physical health. It has been estimated that 40 to 50 percent of American adults have basic or lower literacy skills (Weiss, Fancis, Senf, Heist, & Hargraves, 2006). Those adults with lower literacy skills are 1.5 to 3 times more likely to experience a poor health outcome including disease markers and morbidity than adults with higher literacy skills (Dewalt, Berkman, Sheridan, Lohr, & Pignone, 2004).

The Institute of Medicine reports that "90 million people in the United States lack the literacy proficiency necessary to properly understand and act on health information" (Lincoln, Espejo, Johnson, Paasche-Orlow, Speckman, Webber, & White, 2008, p. 687). With low literacy being challenge for a huge portion of the U.S. population, it is vital that literacy be addressed in understanding mental health and work performance.

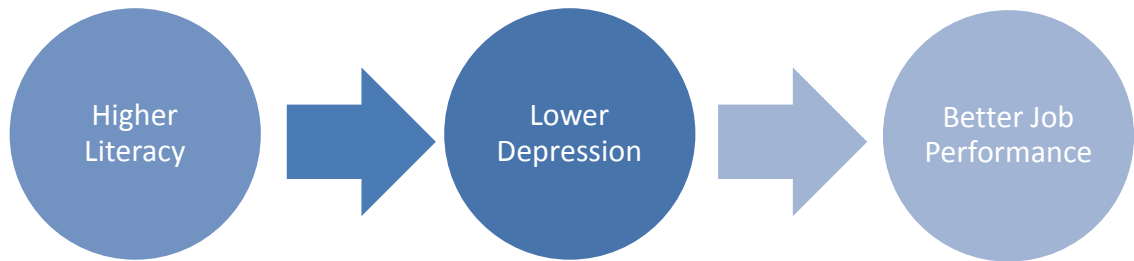
Although there are studies linking mental health and poor work performance, there is minimal research linking literacy and job performance. Many of the existing studies that link literacy and job performance for populations within the United States were completed in the 1980s and 1990s, making much of the existing knowledge outdated. In addition, there is little research indicating the role of literacy in ameliorating or exacerbating employees' mental health challenges and subsequent work performance. Such a gap in the literature has tremendous implications for employers, training programs, and funding for mental health services and adult education programming. If depression can be mitigated through improved literacy skills, then literacy education can be used as a cost effective measure to increase employee well-being and productiveness on two fronts. First, employers would face less absenteeism and presenteeism due to employee mental health problems. Second, employees would experience increased efficacy in work duties because of improved ability to understand and execute tasks. A study focusing on the interrelations among literacy, mental health symptoms, and job performance can fill an important gap in knowledge and would have immediate practical applications. The present study is designed to fill the need for that type of research.

Purpose

This study examined the relations among general literacy, depression, and job performance. Although there is limited research on the negative impact of low literacy on job performance, and much research on the negative impact of depression on job performance, there are no studies examining the extent to which depression may mediate the relationship between literacy and job performance. This study was intended to help close the gap in knowledge related to literacy and job performance. The study is

significant because if depression does mediate the relationship between literacy and job performance, then literacy education could be an effective intervention both to treat depression and to increase work performance. This could have significant policy implications, because funding could be channeled into adult education programs that would not only prepare workers to be ready for high job performance, but also decrease spending on physical and mental health care. Figure 1 depicts the model that was tested in the study.

Figure 1. Model Tested in Research Study.



Chapter 2: Literature Review

Literacy

The word “literacy” has become a hotly debated term that can be interpreted in a multitude of ways depending on the field of study, societal context, and individual experience (EFA Global Monitoring Team, 2005). The United Nations Educational, Scientific, and Cultural Organization outlines four broad areas that encompass nearly all theoretical understandings of literacy: “literacy as an autonomous set of skills, literacy as applied, practiced, and situated, literacy as a learning process, and literacy as text” (EFA Global Monitoring Report, 2005, p. 148). Numeracy is often viewed as one component of literacy and is commonly defined as “the ability to process, interpret, and communicate numerical, quantitative, spatial, statistical, and even mathematical information” (EFA Global Monitoring Team, 2005, p. 150).

The National Assessment of Adult Literacy, created by the National Center for Education Statistics, defines literacy as both task based (or conceptual) and skill based (or operational). The task based definition of literacy is “the ability to use printed and written information to function in society, to achieve one’s goals, and to develop one’s knowledge and potential” (White & McCloskey, forthcoming; Rudd et al., 2004). An example is an individual’s ability to find a bus schedule and read the chart in order to plan a bus trip that will allow him or her to arrive on time for an appointment. The skills based definition used by the NAAL is that individuals need both word level reading skills and higher level literacy skills in order to successfully use printed material (White & McCloskey, forthcoming). An example is an individual’s ability to compare the costs and benefits of two different credit card offers. Both definitions encompass prose literacy,

document literacy, and quantitative literacy (Rudd et al., 2004; White & McCloskey, forthcoming).

One of the best-known adult literacy measures in the United States is the Armed Services Vocational Aptitude Battery (ASVAB). It consists of nine subtests: general science, arithmetic reasoning, work knowledge, paragraph comprehension, math knowledge, electronics information, mechanical comprehension, and assembling objects. The test has been found to have good content validity, construct validity, and criterion related validity (Welsh, Kucinkas, & Curran, 1990). Four parts of the test are valid tools for gauging literacy and numeracy. The paragraph comprehension section tests the verbal domain specifically the ability of a test taker to obtain information from written passages. The word knowledge section also tests the verbal domain by testing the ability to select the correct meaning of a word presented in context and to identify the best synonym for a given word. The arithmetic reasoning and mathematics sections test the math domain by measuring the ability of a test taker to solve arithmetic word problems and the test taker's knowledge of high school mathematics and principles (ASVAB Fact Sheet).

The National Longitudinal Survey of Youth 1997 (NLSY97), which was used in this study, is a longitudinal study conducted by the Department of Labor beginning when the participants were between 12 and 16. It tracks a nationally representative sample of approximately 9,000 participants, interviewing them annually from 1997 to the present. The most recent round for which data is available was in 2013. The NLSY used scoring from the word knowledge, paragraph comprehension, arithmetic reasoning, and math knowledge portions of the ASVAB to gauge literacy and numeracy of participants (NLS website). Other measures commonly used to measure adult literacy include the

Test of Adult Basic Education and the Comprehensive Adult Student Assessment System.

There is scant research on literacy, as defined above, and its effect on health. Even many studies in which the stated focus is on literacy and health outcomes actually use a measure of health literacy in order to gauge literacy level, as opposed to a general literacy measure (Christensen & Grace, 1999; Dewalt, et al., 2004; Sentell & Ratcliff-Baird, 2003; Lincoln, et al., 2008; Morris, MacLean, & Littenberg, 2006; Sudore, Yaffe, Satterfield, Harris, Mehta, Simonsick, Newman, ... Schillinger, 2006).

Of the few studies that used non health related measures of literacy, most show that low literacy has a negative association with aspects of physical health for many reasons, including misinterpretation of health information, failure to follow through on medical treatments, and failure to utilize preventive treatments (Weiss, Hart, & Pust, 1991). For instance, in one study dyslexic adults were found to have significantly lower self esteem, have more feelings of anxiety, and feel less competent than others at written work and academic achievements (Riddick, Sterling, Farmer, & Morgan, 1999). Hoffman-Goetz, Meissner, and Thomson (2009) used proxy measures of literacy such as reading the newspaper and having educational attainment greater than high school. Their results showed that “respondents who reported excellent or good health status were more likely to read a newspaper, go online, and have greater than high school education attainment” (p. 220). They were also less likely to report feelings of frustration related to attempts to find cancer information and feelings of anxiety about getting cancer. Robinson, Clames, and Bazargan (2008) found that youth who received a literacy based intervention related to asthma significantly reduced their rate of hospitalization and

emergency room visits in addition to improving their reading levels. Weiss et al. (1991) asserted that although it is currently unclear what impact poor literacy alone plays in poor health, research points to literacy as a vital factor in positive health maintenance, and their appraisal in 1991 still appears to be accurate.

Literacy difficulties have been found to be comorbid with a variety of psychiatric disorders in children (Maughan & Carroll, 2006). In one British based study of a nationally representative sample of 9-15 year olds, “literacy problems showed significant associations with each of the major disorder categories except depression, with odds ratios ranging from 2.7 for anxiety disorders to 3.8 for ADHD” (Maughan & Carroll, 2006, p. 351). In addition, literacy difficulties were associated with more parental self-reports of emotional/behavioral issues and self-reported lower mood for adolescents (Maughan & Carroll, 2006). Findings suggest a bidirectional relationship between reading difficulties and behavioral challenges, with both exacerbating the other (Maughan & Carroll, 2006). This study was limited by the sample coming from community agencies and thus representing a possible referral bias.

In a study of adults, health literacy was linked to worse depression symptoms amongst individuals with alcohol and drug addictions (Lincoln, Paasche-Orlow, Cheng, Lloyd-Travaglini, Caruso, Saitz, & Samet, 2006). In the study, the “association of literacy with multiple mental health outcomes was assessed” using measuring including Rapid Estimator of Adult Literacy in Medicine, Center for Epidemiologic Studies Depression Inventory, and the Addiction Severity Index. A sample of 380 subjects already participating in a drug treatment program were recruited and classified as having either low or high literacy (Lincoln, Paasche-Orlow, Cheng, Lloyd-Travaglini, Caruso,

Saitz, & Samet, 2006, p. 817). Although low literacy was not associated with higher severity of addiction or mental health related quality of life, it was associated with more depressive symptoms. This study was limited by the specificity of the sample population and the limited number of mental health assessments used (Lincoln, Paasche-Orlow, Cheng, Lloyd-Travaglini, Caruso, Saitz, & Samet, 2006).

Low literacy's association with depression symptoms in those with substance addictions is extremely important in light of another study that showed that the average readability grade level of educational materials used in a national sample of alcohol and drug abuse treatment programs was 11.84, or four grade levels above the average reading level of most Americans (Greenfield, Sugarman, Nargiso, & Weiss, 2004). In addition, program staff estimations of the level of readability were significantly below the actual level, indicating that health care providers are often a poor judge of the suitability of materials used. This study solicited materials from 646 programs nationwide and received materials to analyze from 52 programs. The exploratory analysis had several limitations, including the low rate of participation; however, many of the materials analyzed were from nationwide programs such as Alcoholics Anonymous. Therefore, the study indicates a need for nationwide reevaluation of materials used in order to increase treatment effectiveness.

In fact, mental health assessment tools themselves can be a barrier to appropriate assessment and care. In one study of 63 adults, lower literacy was significantly associated with less comprehension of the Beck Depression Inventory as gauged by three raters with clinical experience (Sentell & Ratcliff-Baird, 2003). In addition, the results of the study suggest that not only is low level of comprehension of reading materials

common, but its prevalence cannot be estimated based on client education level or assessed reading levels (Sentell et al., 2003). However, the sample size of the study was small, and inter-rater reliability was not very high. Therefore, further study is needed to generalize the results of the study.

It is important for health care providers to have an objective measure of literacy levels of their patients instead of trusting patients' self-reports. In one study of an indigent psychiatric population ($n = 45$), 76 percent of the participants read at or below the seventh to eighth grade level based on the Rapid Estimate of Adult Literacy in Medicine screening test (Christensen & Grace, 1999). Within this low literacy group, 29 percent reported that they read "very well" and 47 percent reported that they read "well". Although this study was based on a small sample size and used a screening of word recognition rather than comprehension, it hints at the discrepancy between self-reported and actual literacy, in addition to the need for providers to rethink the materials and methods used to convey health information.

Such evidence is consistent with Berg and Hammitt's (1980) study of both word recognition and reading comprehension skills in a state psychiatric hospital. The study found that most patients were functionally illiterate in reading comprehension skills but were literate in their ability to recognize and pronounce words. In addition, educational background was predictive of ability to pronounce words but not to comprehend material. Written materials used in the hospital were far above most patients' comprehension ability. Like many other studies, this one was limited by the small sample size.

Few studies related directly to literacy and mental health intervention efficacy were found for the present review. One study (Weiss, Francis, Senf, Heist, & Hargraves,

2004) did examine the efficacy of literacy education as a treatment for depression. A sample of 70 adult patients from a community health center who screened positive for depression (using the Patient Health Questionnaire or PHQ-9) and low literacy (using the REALM) were randomly assigned to a treatment group and control group. Patients in the control group were given standard treatment for depression from their primary care provider, while the treatment group received the same care from their primary care provider and participated in a literacy intervention program. Depression severity in the two groups was similar at baseline, but at the second and final follow up the intervention group had significantly lower PHQ-9 scores than the control group. This study was limited by the number of participants; however, should the findings be borne out in larger studies, they have very important implications for treatment of depression.

Findings by Bennett, Culhane, McCollum, Mathew, and Elo (2007) suggest that the link between limited literacy and depression exists for speakers of Spanish as well as English. A sample of 99 Latinas who were receiving prenatal care and who had limited English proficiency were given the TOFHLA in Spanish. Those women who were found to have inadequate literacy in Spanish based on their TOFHLA were more than twice as likely to have depression scores above the clinical threshold. This suggests that not only having limited English proficiency but being limited in literacy skills in their mother tongue contributes to the depression symptoms of this population. The study was limited by a small sample size, but the findings point to an important congruence across language populations in the United States between lack of literacy skills and depression symptoms.

Literacy and work performance. Not only does literacy affect mental health, particularly the occurrence of depression; it also has a significant impact on job performance. In the United States, adults who have medium to high proficiency in literacy and numeracy earn significantly more than those with low proficiency even when controlling for experience, gender, community size, employment status, immigrant status, parent's education, and level of education (Statistics Canada, & Organisation for Economic Co-operation and Development, 2011). In addition, those with high literacy skills are 1.2 to 1.5 times more likely to have obtained full time employment in the past year as compared to those who have low literacy skills (Statistics Canada, & Organisation for Economic Co-operation and Development, 2011).

Higher literacy may also influence the opportunities that individuals have to receive training from employers, thus providing opportunities for advancement. The National Longitudinal Survey of Youth found that “young adults with a high school diploma were nearly twice as likely as high school dropouts to have received some training from their employer” (Sum, 2007, p. x). College graduates were almost three times as likely to have received training. This points to literacy as not just a key to obtaining employment, but advancing it.

Increasing literacy can significantly increase an individual's earning potential and ability to obtain full time, year round employment. Data from the 1992 National Assessment of Adult Literacy showed that a sixty point increase (moving up approximately one level in literacy) in prose literacy on the National Adult Literacy Survey results in a four percent rise in the estimated likelihood of working (Sum, 1992). The same study found that weekly earnings rose continuously as literacy proficiency

increased, with the mean weekly earnings of men scoring in level three of proficiency standing at 59 percent higher than those of men who scored in level one. The difference for women was 51 percent. Similarly, the 2003 National Adult Literacy Survey found that across all three scales (prose, document, and quantitative literacy) approximately two-thirds of adults with *Proficient* literacy and half of adults with *Intermediate* literacy were employed full-time, whereas that was true for only approximately one-third of those who scored in the below basic level (Kutner, Greenberg, Jin, Boyle, Hsu, & Dunleavy, 2007). In addition, 17 to 18 percent of adults who scored in the below basic level earned less than \$300 a week, whereas that was true for only 3-6 percent of those who scored proficient across three types of literacy. The limitations that literacy places on employment opportunities are clearly noticed by individuals with low literacy. In 2003, “thirty-five percent of adults with *Below Basic* prose literacy and 34 percent of adults with *Below Basic* document literacy reported that their reading skills limited their job opportunities ‘a lot’ ...in contrast nearly all those with *Proficient* prose and document literacy (92 to 96 percent) agreed that their reading skills did ‘not at all’ limit their job opportunities” (Kutner et al., 2007, p .54).

Depression

Approximately 7% of the population of the United States will experience an episode of major depressive disorder within a twelve-month period. Major depressive disorder is defined by the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013) as an individual having at least five of the following symptoms nearly every day over a two week period: depressed mood most of the day, loss of interest or pleasure in all or almost all activities, significant change in

weight, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or guilt, diminished ability to think or concentrate, and recurrent thoughts of death or suicidal ideation. In order to meet the clinical threshold for diagnosis of major depressive disorder, these symptoms must cause significant distress or impairment in daily functioning.

Subclinical depression. Based on epidemiologic community surveys, the prevalence of depression symptoms is higher than the prevalence of depressive disorders (Boyd, Weissman, Thompson, & Myers, 1982). Most of the population has one or two depression symptoms at any given time, and between 9 and 20% of the population is experiencing enough symptoms to qualify for a depressive disorder diagnosis. However, the prevalence of formally diagnosed depressive disorders is between 3 and 9%. This indicates that many thousands of people are experiencing depression symptoms but do not meet the minimum threshold for a diagnosis.

Subsyndromal depression (also known as subclinical depression) is defined as having two or more symptoms of depression for at least two weeks, associated with social dysfunction but not meeting criteria for diagnosis of any other depressive disorder (Forsell, 2007). Having minor depression or subsyndromal depression increases the risk for major depressive disorder four to five times. Forsell (2007) found in a three-year study of depression symptomatology that 26.5% of individuals who had subsyndromal depression received a more severe diagnosis (of minor or major depression) three years later. Of those individuals who initially were diagnosed with depression, 13% of those with minor depression and 41.9% of those with major depression remained in the same diagnostic category. This study highlights the risk that those with even only two

depression symptoms have of becoming clinically depressed in subsequent years. Not only does major depression impair the functioning of individuals, but experiencing even some symptoms of depression can cause impairment.

Compared to having no symptoms, subsyndromal depression symptomatology is associated with small but significant decreases in psychosocial functioning (Judd et al., 1998). On a population basis, as much or more service burden and impairment was associated with depression symptoms as compared to a diagnosed depressive disorder (Johnson, Weissman, & Klerman, 1992). Depression symptoms were associated with emergency department use, use of tranquilizers, sleeping pills, and antidepressants, days lost from work, and suicide attempts. An epidemiological study in North Carolina found that, compared to asymptomatic individuals, individuals with major depression had 4.78 times the risk of a disability (95% confidence interval, 1.64 to 13.88) and individuals experiencing depression symptoms were at 1.55 times greater risk for disability (95% confidence interval, 1.00 to 2.40) (Broadhead, Blazer, George, & Tse, 1990). In addition, because subclinical depression was more prevalent than major depressive disorder, it was associated with 51% more disability days than major depression. In fact, individuals experiencing subsyndromal depression symptoms experience worse social functioning and more days in bed, with all other factors being equal, than individuals with hypertension, diabetes, arthritis, and gastrointestinal difficulties (Wells et al., 1989). Therefore subsyndromal depression, according to some researchers, qualifies as an active state of illness, although more research is needed to determine specific effects.

Silva Lima and de Almeida Fleck (2007), in a sample of 428 primary care users, found that depression symptoms can be directly correlated with quality of life. Severity of

depression was found to be the variable with the highest correlation with measures of quality of life dimensions, as compared to demographic variables. Participants with major depression experienced the worst quality of life, and participants with subsyndromal depression experienced a smaller impact on their quality of life, but still more than participants without depression. In another large international study of older adults, even subsyndromal depression was found to have significant negative associations with quality of life and attitudes toward aging (Chachamovich, Fleck, Laidlaw, & Power, 2008). Goldney, Fisher, Dal Grande, and Taylor (2003) also found that subsyndromal depression (experienced by 12.9% of the representative sample) had a significant negative association with quality of life, as compared to those without depression symptoms, and subsyndromal depression was associated with greater use of primary health services.

Assessment of depression symptom severity. Depressive disorders are diagnosed primarily through clinical interviews, using standard criteria for diagnoses. In contrast, depression symptom severity (whether subsyndromal or not) typically is assessed with self-report scales in which the respondent reports the frequency and/or severity of the common depression symptoms. Among the most commonly used scales for assessing depression symptoms are the Beck Depression Inventory, the Center for Epidemiologic Studies Depression Scale (CES-D), the Patient Health Questionnaire (PHQ-9), and the Mental Health Inventory (MHI-5).

The Beck Depression Inventory is a 21-question self-report questionnaire (Beck, Steer, & Garbin, 1988). In a meta-analysis of twenty-five years of research studies on the psychometric properties of the BDI, a mean internal consistency (Cronbach alpha) was calculated to be 0.86 for psychiatric patients and 0.81 for nonpsychiatric subjects (Beck

et al., 1988). In the same meta-analysis, the BDI was found to differentiate depression from anxiety effectively.

The CES-D is a 20-statement self-report measure (Radloff, 1977). Participants are asked to choose on a Likert scale the frequency with which they have experienced each symptom in the past week. Symptoms include feeling bothered by things that usually do not bother the participant, feeling like they could not shake off the blues, feeling depressed, feeling fearful, and feeling lonely. This scale was developed primarily for use in epidemiological studies as opposed to clinical purposes. It is highly correlated with more clinically based measures and assesses depression symptom severity.

The PHQ-9 is a nine-item self-report measure that asks respondents to choose if they have experienced symptoms “not at all”, “several days”, “more than half the days”, or “nearly every day” for the past two weeks (Kroenke & Spitzer, 2002). The symptoms on the scale are highly correlated with the DSM-IV symptom cluster for major depressive disorder. Symptoms include having little energy, having, little interest or pleasure in doing things, feeling down or depressed, having disruptions in sleep, having a poor appetite or overeating, feeling bad about yourself, having trouble concentrating, moving or sleeping slowly, and having thoughts that you are better off dead. There is also one question asking how difficult this has made it for the individual to take care of things at work or at home. Kroenke and Spitzer (2002) suggest a cut-off score of 10 for diagnosing major depression using the PHQ-9, which has a sensitivity level for correctly identifying major depression of 88%. For a score of 5-9, “watchful waiting” by the physician is recommended. Nevertheless, the PHQ-9 assesses symptom severity.

The MHI-5 (Mental Health Inventory) is a five item self-report measure. Each item asks how much in the past month the respondent has experienced a symptom. Respondents answer on a six point Likert scale ranging from none of the time to all of the time. The MHI-5 is a shortened form of the MHI-18 and contains one item from the anxiety subscale, one item from the depression subscale, two items from the general positive affect subscale, and one item from the behavioral and emotional control subscale. Berwick et al. (1991) found the MHI-5 to be equal to the MHI-18 and General Health Questionnaire (GHQ-30) in detection of anxiety disorders and major depression. In fact, the one item asking how frequently a respondent has felt “downhearted and blue” was found to have an AUC (area under curve) value of 0.840 in detecting major depression which is similar to the AUC value of the MHI-5 (0.892) and MHI-18 (0.897) in their entirety. In addition, the AUC value of the one item is not statistically different from the entire GHQ-30 in detection of major depression.

Depression and work performance. Much research has focused on the significant impact that depression has on job performance and job attainment. Depression is associated with impaired work performance and safety (Berndt et al., 1998; Haslam, Atkinson, Brown, & Haslam, 2005; Kessler et al., 2006; Stewart, Ricci, Chee, Hahn, & Morganstein, 2003). Wright, Bonett, and Sweeny (1993) found in a two-year longitudinal survey that psychological well-being of employees was positively correlated with subsequent work performance (measured by evaluation in goal emphasis, team building, and work facilitation). Depression has been found to have the greatest detrimental effect on work performance as compared to all other conditions studied (Kessler et al., 2008). Birnbaum et al. (2010) found that, projected to the U.S. workforce, depression-related

worker productivity losses totaled nearly \$2 billion. In addition, severely and moderately depressed workers missed more work than non-depressed workers, and they lost a salary equivalent of approximately \$199. The effects persist even among those whose depression symptoms are clinically improved (Adler et al., 2006; Goldman & Drake, 2006).

Not only have effects been found over the long term, but at specific moments in time. Wang et al. (2004) found that out of seven conditions (allergies, arthritis, back pain, headaches, high blood pressure, asthma, and major depression), only depression was significantly related to poorer work performance as assessed by task focus and productivity. Furthermore, Wang et al. asserted that studies focused on missed days from work significantly underestimate the negative economic effects associated with depression because prior studies did not include loss of productivity. Furthermore, there is evidence that the relationship between depression and work problems is bi-directional. For example, Andrea, Bültmann, van Amelsvoort, and Kant (2009) found that job insecurity increased the risk that an employee would experience depression. This finding could be especially important for low literacy individuals who experience great job insecurity, thus possibly placing them at greater risk for depression, which in turn may affect their work performance negatively.

Some studies have also linked literacy, mental health status, and employment. One longitudinal study of children with developmental language difficulties (Law, Rush, Schoon, & Parsons, 2009) looked at mental health and employment at age 34. Children with non-specific language impairments (NSLI) were four times as likely to have poor adult literacy as compared to children with typical language development. In addition,

children with NSLI were 2.9 times more likely to have poor mental health outcomes. Finally, children with NSLI were 1.88 times as likely to have periods of unemployment as adults. Although this cross-sectional study shows associations and cannot determine causation, it does highlight important possible links among literacy, mental health, and work.

Another study examined the role that limited literacy and depression may play in impeding the ability of mothers on welfare to return to work. In a sample of 351 low income, African American mothers, 52.6 percent were found to have low levels of literacy, 39.5 percent had moderate to high levels of depression symptoms, and 24.6 percent were experiencing both low literacy and depression symptoms. Low literacy skills were found to be predictive of less employment during a two year follow up period, whereas depression symptoms were not predictive of employment (Zaslow, Hair, Dion, Ahluwalia, & Sargent, 2001).

Work Performance

Although employee illness and stress may not be directly measurable, sick or exhausted employees are unlikely to be energetic or motivated in their work (Karasek, 1992). Most studies on work productivity consider four types of costs: the costs of absenteeism, the costs of extra employees needed to do the job of the impaired workforce, turnover, and sabotage. The largest cost to companies is preventable ineffectiveness on the job. Costs of presenteeism and absenteeism have been estimated to be \$260 billion per year (Mattke, Balakrishnan, Bergamo, & Newberry, 2007).

The most common method used to measure productivity loss among the employed is the human capital approach, which uses the present value of lost time due to

employee absence (Zhang, Bansback, & Anis, 2011). Loss of productivity can be measured either through absenteeism (days absent from work) or presenteeism (days spent at work, but not doing work). Although a number of different instruments have been developed to measure lost productivity due to presenteeism, they vary widely in the estimates that they produce regarding economic loss. Additional indirect costs due to an employee's illness include employee turnover and the cost of training new employees, the lack of a perfect substitute in situations with time sensitive work, and the impact on team productivity in a team work environment.

Indirect costs of work loss and productivity can also be seen as consisting of three components: mortality, morbidity, and reduced productivity for both the individual and the employer (Berger, Murray, Xu, & Pauly, 2001). Mortality results in the cost of employee replacement. Morbidity produces costs of lost wages in terms of paid and unpaid sick leave days, benefits for absent employees, and loss of vacation time. Lost productivity may include on the job training, new-hiring administration and training, and poor motivation. The costs can be seen from an individual, employer, and societal perspective. For an individual, indirect costs of illness are lost income and leisure time. From an employer perspective, the cost of an illness would involve hiring and training new workers, having workers on the job who do not produce results for the organization, and benefits and payroll costs for employees who are not attending work.

Because it is so difficult to calculate the costs of absenteeism and presenteeism, and because of the need for valid and reliable data in order to develop effective programs, there have been a number of attempts to develop an instrument to measure and monitor health related productivity costs. There are currently approximately 20 instruments that

use employee self-reporting to capture presenteeism and absenteeism (Mattke et al., 2007). In these measures, absenteeism is generally measured using an employee self-report of days missed due to illness. Few companies routinely collect lost time data. Presenteeism is more difficult to measure directly. One measurement used is the employee assessment of perceived impairment. Generally perceived impairment is measured using self-report questionnaires asking employees questions about how much they think their work performance is being helped or hurt by outside factors like health problems. A second measure used is comparative productivity and efficiency as compared to others in the same position. This is often measured by looking at the output (i.e., units sold) of two employees in the same position. If output is different, then tools like self-report questionnaires can help uncover the cause of the difference (skill level, health problems, conflict in the work place, etc.). A final measure used is an employee estimation of unproductive time at work.

Monetizing lost productivity is even more complicated. The three main methods used in the instruments are salary conversion methods, introspective methods that give an estimation of the magnitude of lost productivity, and firm-level methods that monetize losses on the basis of counter measures used to deal with absenteeism and presenteeism (i.e. the cost of an employee incentive program rewarding high number of cars sold). Although some measures have been validated as a tool for measuring presenteeism and absenteeism, none of the measures to date have been validated as tools for monetizing lost productivity.

Related specifically to the work related costs of depression, studies have generally consisted of four types: cross-sectional naturalistic studies, longitudinal naturalistic

studies, longitudinal uncontrolled treatment studies, and controlled treatment trials (Simon et al., 2001). The first major cross-sectional naturalistic study, the Medical Outcomes study, found that the level of impairment at home, school, and work associated with depression is comparable to other chronic conditions including arthritis, hypertension, and diabetes. These findings have been confirmed by several later studies, including one conducted by the WHO using a sample of 25,000 people in 14 countries. Major depression was associated with a mean of 7.7 days with some experienced disability in the past month. A disadvantage of the cross-sectional studies is that they are unable to examine the causal relationship between depression severity and work performance.

A small number of longitudinal studies looked at depression and work performance over time. These studies found that when depression severity is lower, it can reduce work impairment by as much as 72% and result in a return to normal psychosocial functioning. Uncontrolled treatment studies, although many show an association between reduction in depression and increased work performance, cannot prove that effective depression treatment improves work performance. However controlled treatment studies can. Controlled trials have found significant differences between treatment and placebo groups on several measures; for instance, maintaining paid employment over a twelve-month period. Some estimates suggest that between 45% and 98% of the cost of treatment for employees could be offset by the resulting gains in work productivity. Despite the array of studies and resulting data, more research and rigorous trials are needed to demonstrate the effectiveness of treatment programs for depressed workers in terms of increasing productivity.

Summary of Literature Review

Literacy is associated with better health outcomes and better work performance. In addition, depression costs American businesses and employees billions of dollars each year because of absenteeism and presenteeism. Although literacy is linked to both severity of depression symptoms and level of work performance, there is no research specifically examining the association between literacy and depression symptoms and subsequent work performance. Literacy has been shown to be an effective intervention for physical health problems and has been associated with better work performance. Further research should be conducted to examine the possible use of literacy as an intervention for both depression and poor work performance.

Hypotheses

Based on findings from prior research, the following hypotheses were tested in the present study:

1. The lower an individual's level of literacy, the more severe the depression symptoms he or she will experience.
2. The lower an individual's level of literacy, the poorer his or her work performance will be.
3. The more severe depression symptoms individuals experience, the poorer their work performance will be.
4. Severity of depression symptoms will mediate the association between lower literacy and poorer work performance.

These hypotheses are represented in Figure 1.

Chapter 3: Method

Sample

This study used the sample from the National Longitudinal Survey of Youth 1997 (NLSY97) conducted by the Bureau of Labor Statistics. The NLS97 consists of a nationally representative sample of about 9,000 youths who were between the ages of 12 and 16 before December, 31, 1996. Youth and parents were surveyed during the first year of the study. Youth were surveyed annually and the study is currently still running. The survey gathers data regarding youth transition from school to work. It therefore collects data related to labor market behavior, educational experiences, armed services vocational aptitude testing, high school information, government program participation, family life, health issues, and assets and income.

The sample was selected through a screening of 75,291 households in 147 primary sampling units (metropolitan area, county, or group of counties). All household residents between ages 12 and 16 were considered eligible. A cross sectional sample was drawn to be representative of the population born in the U.S. between 1980 and 1984. A supplemental sample was drawn of black and Hispanic youth to facilitate reliable statistical analysis of those groups. The full sample was used in this study. The demographic breakdown of race/ethnicity and gender can be seen in Table 1.

Table 1. Sample demographic characteristics (NLSY97 Round 1)

DEMOGRAPHIC CHARACTERISTIC	NUMBER OF INDIVIDUALS
MALE	4,599
FEMALE	4,385
NONBLACK/NONHISPANIC	4,665
BLACK	1,091
HISPANIC OR LATINO	941
MIXED	81
SUPPLEMENTAL SAMPLE, BLACK/NON-HISPANIC	1,254
SUPPLEMENTAL SAMPLE, HISPANIC	980

Surveys were completed by an interviewer in person. Most questions were asked by an interviewer; however, a supplement containing more sensitive questions (e.g., sexual behavior) was filled out by participants. The time between interviews was approximately twelve months. In addition, schools that were in a primary sampling area and had a grade 12 were given school surveys to fill out. These surveys provided detailed characteristics of schools and had a 72% response rate (Ohio State University, 2000). In 1997 and 1998, participants took the computer adapted version of the ASVAB. Because of comprehensive efforts to track participants' locations and a strong follow up strategy focused on obtaining responses from all participants, the percentage of non-responders per year was minimal, and overall retention of participants was strong (85.7% in Round 7).

The specific subset of survey participants that was used in this study includes those who reached age 29 in rounds 13-15. This subset of survey participants was chosen because the supplemental “Health at Age 29” survey contains questions related to emotional health and work performance that are not found in other rounds of the survey. The frequency tables for the sample used can be seen in Tables 2, 3, and 4 below.

Table 2. Gender Demographic Characteristics of Sample

SEX	FREQUENCY	PERCENT
MALE	536	51.1
FEMALE	512	48.9
TOTAL	1048	100

Table 3. Race Demographic Characteristics of Sample

RACE	FREQUENCY	PERCENT
BLACK	285	27.2
HISPANIC/LATINO	226	21.6
MIXED	8	.8
NONBLACK/NONLATINO	529	50.5
TOTAL	1048	100

Table 4. Education Demographic Characteristics of Sample

HIGHEST GRADE EVER COMPLETED	FREQUENCY	PERCENT
6-8TH GRADE	24	2.3
9-11TH GRADE	149	14.2
12TH GRADE	279	26.6
SOME COLLEGE/COLLEGE	432	41.5
ABOVE COLLEGE	154	14.7
MISSING	7	.7
TOTAL	1048	100

*Table 5. Means of Sample by Measure***Group Statistics**

	N	Mean	Std. Deviation
AFQT Percentile	797	46.28	28.84
Extent to which emotional problems limited productivity	797	2.91	.334
Emotional Distress Scale	797	9.45	2.30
Average Weeks Worked Per Job	797	32.60	15.74

Measures

Job performance. Measures used to gauge job performance included the number of weeks the respondent worked in the past year and a self-report measure of emotional difficulty in completing work. The number of weeks worked provides a clue regarding job performance. One would expect that an individual contributing to their position at an adequate level would maintain a longer employment than individuals who are not adequately performing. In addition, this study used a self-report measure asking if the participant has less than they would have liked because of emotional difficulties. This measure was used to demonstrate the degree to which employees notice that their work performance has been poorer due to effects of emotional and mental health. Because the survey did not include reports from supervisors regarding individuals' work performance, this measure provides a gauge of job quality.

Depression. Depression was measured using the five-item Mental Health Inventory (MHI-5). This scale asks five questions that are answered on a four-point Likert response scale ranging from all of the time (1) to none of the time (4). The questions ask the respondent about the past month and include: How often has the respondent felt down or blue? How often has the respondent been a happy person? How often has the respondent been depressed? How often has the respondent been a nervous person? and How often has the respondent felt calm and peaceful?

In a study comparing the MHI-5 to other commonly used mental health screening instruments, receiver operating curve analysis was used. The MHI-5 was found to be as good as the 18-item MHI and the General Health Questionnaire, and superior to the Somatic Symptom inventory for detecting most significant mental health disorders

including major depression, affective disorders, and anxiety disorders. The “areas under the curve” for the MHI-5 was 0.892 for major depression (Berwick et al., 1991).

In order to create one total score to indicate the level of emotional distress, a summary measure was created. The two positive items on the MHI-5 (happy person and feeling calm and peaceful) were reverse coded so that a higher score indicated more distress. Next the scores for the five items were summed to create a measure of emotional distress with possible scores ranging from five to 20, with higher scores indicating more emotional distress.

General literacy. Individuals’ general literacy was measured using verbal and quantitative scores from the ASVAB, which was completed by all respondents in the survey. The present study used a percentile ranking of the Armed Forces Qualifications Test (AFQT) verbal and math scores.

All individuals participating in the survey took the ASVAB in 1997 or 1998. The scores for the arithmetic reasoning, mathematical knowledge, paragraph comprehension, and work knowledge sections were calculated and comprise the unofficial Armed Forces Qualifications Test score or AFQT (Aptitude, Achievement & Intelligence Scores). A percentile score was calculated by computing a verbal composite score, summing word knowledge and paragraph comprehension raw scores; converting subtest raw scores for verbal, math knowledge, and arithmetic reasoning; multiplying the verbal standard score by two; summing the standard scores for verbal, math knowledge, and arithmetic reasoning; and finally converting the summed standard score to a percentile.

AFTQ scores are reported as a percentile, referencing 18 to 23 year olds (ASVAB website). Reliability for AFQT scores is shown in Table 2.

Table 6. Reliability of AFQT scores

Estimated Reliabilities for
AFQT Scores and the AFQT Subtests

Group	AFQT		AR		WK		PC		MK	
	P&P	CAT	P&P	CAT	P&P	CAT	P&P	CAT	P&P	CAT
All	0.94	0.97	0.87	0.92	0.88	0.93	0.75	0.85	0.85	0.93
Male	0.94	0.97	0.87	0.92	0.88	0.93	0.75	0.85	0.85	0.93
Female	0.94	0.97	0.86	0.92	0.88	0.93	0.75	0.86	0.85	0.93
Hispanic	0.94	0.97	0.87	0.92	0.88	0.92	0.76	0.86	0.85	0.92
Non-Hispanic	0.94	0.97	0.87	0.92	0.88	0.93	0.75	0.85	0.85	0.93
American-Indian	0.94	0.97	0.87	0.92	0.88	0.93	0.75	0.85	0.85	0.93
Asian	0.93	0.96	0.87	0.91	0.87	0.91	0.75	0.86	0.85	0.93
Black	0.94	0.97	0.85	0.91	0.89	0.92	0.76	0.86	0.84	0.92
Pacific Islander	0.94	0.97	0.85	0.92	0.88	0.92	0.76	0.86	0.84	0.93
White	0.94	0.97	0.88	0.92	0.88	0.93	0.74	0.85	0.85	0.93

However, the AFQT scores for the NLSY97 were normed within three-month cohorts to correct for the disparities in educational attainment at the time of testing. Because of the wide age range of participants, there existed a natural gap in knowledge between the youngest and oldest cohorts. Item response theory was used to generate the AFQT scores for the NLSY97, meaning that a computer program generated summary scores for each subject area (Appendix 10, NLSY97 Codebook Supplement). It was found that word knowledge, paragraph comprehension, arithmetic reasoning and math knowledge subscales were all unidimensional (Ing, Lunney, & Olsen, n.d.).

Procedure

The present study involved secondary analysis of data in the existing database from the National Longitudinal Survey of Youth - 1997 conducted by the Bureau of Labor Statistics. The survey began in 1997 and is still collecting data related to employment, education, and health for a cohort of individuals who were between the ages of 12-16 when the study began. Data are collected via personal interviews with

¹ P&P=paper and pencil test, CAT= computer adapted test, AR= arithmetic reasoning, WK=word knowledge, PC=paragraph comprehension, MK=math knowledge

participants. The database was accessed by using the web based NLS investigator and analyzed using SPSS software. This investigator tested the study's hypotheses using the variables found in Table 3, controlling for gender, race, and level of education.

Disparities in scores between male and female test takers and between test takers of different races exist across many standardized tests including the SAT, the Graduate Record Exam (GRE), and AP mathematics tests (Heckman, Larenas, & Urzua, 2005; Jencks & Phillips, 2011; Niederle & Vesterlund, 2010; Pope & Sydnor, 2010). Therefore by controlling for race and gender, the study limited the effects of the gender and racial biases inherent in test scores. In addition, because individuals with more years of schooling would generally have more knowledge related to verbal comprehension and math problem solving, it was important to control for the level of educational attainment when using literacy scores.

Table 7: Calculation of Scores for Measures

VARIABLE	MEASURE	CALCULATION
LITERACY	<ul style="list-style-type: none"> • Percentile ranking for ASVAB subject tests 	<ul style="list-style-type: none"> • Percentile ranking as calculated by the NLSY97.
JOB PERFORMANCE	<ul style="list-style-type: none"> • Average number of weeks worked in last calendar year • Emotional difficulty in completing work 	<ul style="list-style-type: none"> • Data for the same year in which the participant took the MHI-5 were used. • Number of weeks worked was calculated using the NLSY97 summary measure for the previous calendar year. • Because the survey counts weeks worked at multiple jobs as distinct and not overlapping, the total number of weeks worked were divided by

DEPRESSION	<ul style="list-style-type: none"> • MHI-5 	<p>the total number of jobs held that survey year to create an average measure of weeks worked per job.</p> <ul style="list-style-type: none"> • Emotional difficulty was measured using respondent's answer to "Have emotional problems caused you to accomplish less in the past four weeks than you would have liked?" Answer was given as "yes, a lot", "yes, a little", or "no". • Total score computed from the five items at the time points listed for job performance
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Chapter 4: Results

Tests of the Hypotheses

Pearson Correlations

Tests regarding this study's hypotheses involved bivariate Pearson correlations and stepwise multiple regression analyses, based on 797 cases that had data on all of the variables involved in the hypotheses. Those tests yielded the following results.

Table 7. Pearson Correlations of All Measures

		Correlations					
		Sex	Race	Average Weeks Worked Per Job	Emotional Distress Scale	AFQT Percentile Score	Emotional problems limiting productivity
Sex	Pearson Correlation	1	-.059	.051	.141	-.038	-.050
	Sig. (2-tailed)		.048	.075	.000	.142	.080
	<i>n</i>		797	797	797	797	797
Race	Pearson Correlation		1	-.014	.046	.431	-.056
	Sig. (2-tailed)			.347	.095	.000	.059
	<i>n</i>			797	797	797	797
Average Weeks Worked Per Job	Pearson Correlation			1	-.038	.013	.060
	Sig. (2-tailed)				.139	.353	.054
	<i>n</i>				797	797	1048
Emotional Distress Scale	Pearson Correlation				1	-.018	-.175
	Sig. (2-tailed)					.309	.000
	<i>n</i>					797	797
AFQT Percentile Score	Pearson Correlation					1	.043
	Sig. (2-tailed)						.115
	<i>n</i>						797

The stepwise multiple regression analyses included the control variables of race and sex. The following are the results of those tests. Although the Pearson correlation

tests reported in Table 7 were two-tailed, when they were examined in terms of the study's hypotheses regarding relations among literacy, emotional distress and work performance, one-tailed probability values were used due to the directional nature of the hypotheses.

Hypothesis 1 stated that the lower an individual's level of literacy, the more severe the emotional distress symptoms he or she will experience. A Pearson correlation was computed between literacy level and emotional distress symptoms, and it was found to be $-.018$, which was not significant ($p = .309$). Thus, the results did not support the hypothesis.

In the stepwise multiple regression analysis predicting level of emotional distress, the control variables of sex and race were entered in the first step. The multiple correlation $R = .151$, and $R^2 = .023$, which was significant; $F(2, 794) = 9.27, p < .001$. Race was not a significant predictor of emotional distress ($\beta = .055, p = .118$), but sex was ($\beta = .144, p < .001$). Females reported greater emotional distress than males did. In the second step of the analysis, literacy scores were entered as a predictor variable, and $R = .156, R^2 = .024$, and change in $R^2 = .002$, which was not significant. Thus, after controlling for race and sex, literacy was not a significant predictor of subjects' levels of overall emotional distress. Consistent with the Pearson correlation finding, the results did not support Hypothesis 1.

Hypothesis 2 stated that the lower an individual's level of literacy, the poorer his or her work performance will be. Pearson correlations were computed between literacy level and the two indices of work performance – the number of hours that the individual worked per week across all jobs and the degree of difficulty that the individual reported

having with work due to emotional problems. The correlation with number of hours worked per week across all jobs was .019, which was not significant ($p = .296$). This finding did not support the hypothesis.

In the stepwise multiple regression analysis predicting the number of hours that the individual worked per week across all jobs, the control variables of sex and race were entered in the first step. The multiple correlation $R = .051$, and $R^2 = .003$, which was not significant; $F(2, 839) = 1.092$, $p = .336$. In the second step of the analysis, level of literacy was entered as a predictor variable, and $R = .056$, $R^2 = .003$, and change in $R^2 = .000$, which was not significant ($p = .498$). Similar to the Pearson correlation result, this finding did not support the hypothesis.

Also regarding Hypothesis 2, the Pearson correlation between literacy level and degree of difficulty that the individual reported having with work due to emotional problems was $-.054$, which reached the level of a trend ($p = .060$). In the stepwise multiple regression analysis predicting the degree of difficulty that the individual reported having with work due to emotional problems, the control variables of sex and race were entered in the first step. The multiple correlation $R = .063$, and $R^2 = .004$, which was not significant ($p = .186$). In the second step of the analysis, level of literacy was entered as a predictor variable, and $R = .073$, $R^2 = .005$, and change in $R^2 = .001$, which was not significant ($p = .290$). Thus, after controlling for race and sex, subjects' levels of literacy did not predict the degree of difficulty that the individual reported having with work due to emotional problems. The hypothesis was not supported.

In summary, none of the findings for the number of hours worked per week supported Hypothesis 2, the Pearson correlation finding for the association between

literacy level and level of difficulty with work due to emotional problems showed a trend in the hypothesized direction, but after the variables of race and gender were controlled in the multiple regression analysis the hypothesis was not supported.

Hypothesis 3 stated that the more severe emotional distress symptoms that individuals experience, the poorer their work performance will be. The Pearson correlation between the level of overall emotional distress and the number of hours worked per week across all jobs was $-.038$, which was not significant ($p = .139$). In the stepwise multiple regression analysis predicting the number of hours worked per week across all jobs, the control variables of race and sex were entered in the first step, $R = .052$ and $R^2 = .003$, which was not significant ($p = .339$). In the second step of the analysis, overall level of emotional distress was entered as a predictor variable, and $R = .069$, $R^2 = .005$, and change in $R^2 = .002$, which was not significant; $F(1, 793) = 1.653$, $p = .199$. Thus, the findings did not support Hypothesis 3.

The Pearson correlation between level of overall emotional distress and the degree of difficulty that the individual reported having with work due to emotional problems was $.175$, which was significant ($p < .001$). Thus, the hypothesis was supported by the finding that individuals who experienced more overall emotional distress symptoms report that their work was impeded more by emotional problems, but not for effects on the number of hours worked. In the stepwise multiple regression analysis predicting the degree to which the individual's work was disrupted by emotional problems, the control variables of race and sex were entered in the first step, and $R = .077$ and $R^2 = .006$, which was a trend; $F(2, 794) = 2.358$, $p = .095$. In the second step of the analysis, emotional distress level was entered as a predictor, and $R = .183$, $R^2 = .034$, and

change in $R^2 = .028$, which was significant; $F(1, 793) = 22.753, p < .001$. Thus, after controlling for race and sex, there was still a significant relationship between overall emotional distress and the degree to which individuals reported that their work was disrupted by emotional problems ($\beta = .168, p < .001$). This supported Hypothesis 3.

In summary, the findings for number of hours worked per week across all jobs did not support Hypothesis 3, but those for the degree to which individuals' work was disrupted by emotional problems did support the hypothesis.

Hypothesis 4 stated that severity of emotional distress symptoms would mediate the association between lower literacy and poorer work performance. However, one of the statistical requirements in for a variable to be a mediator of the association between two other variables is that it must be significantly related to each of those two variables (Baron & Kenny, 1986). As described above, the tests of Hypothesis 1 indicated that subjects' levels of literacy were not significantly associated with their overall levels of emotional distress, so emotional distress could not be a mediator between literacy and work performance. Therefore, Hypothesis 4 was not supported.

Chapter 5: Discussion

Among the four hypotheses of the study, only one was partially supported. After controlling for race and gender, there was a significant relationship between individuals' levels of overall emotional distress and the degree to which they reported that their work was affected adversely by emotional distress. This is consistent with findings of previous studies that depression and anxiety are the first and fifth (respectively) most costly health conditions for employers; i.e., that emotional problems interfere with the quality and quantity of workers' productivity (Harvard Mental Health Letter, 2010). The correlation that this study found between emotional distress and adverse effects on work performance further emphasizes the importance of mental health for employees. It supports research that depression is associated with emergency department use, use of tranquilizers, sleeping pills, and antidepressants, days lost from work, and suicide attempts, and greater risk of a disability (Broadhead, Blazer, George, & Tse, 1990; Johnson, Weissman, & Klerman, 1992). Employers should take note of this robust body of research and consider wide-scale mental health interventions as a first step in reducing worker absence and increasing productivity. Although this study supported prior research showing that emotional distress is associated with work impairment, in this study individuals' levels of overall emotional distress were not related to the other index of job performance that was used in this study; namely the number of hours worked per week across all jobs.

Although a Pearson correlation indicated a statistical trend toward higher levels of literacy being associated with less negative impact of emotional difficulties on individuals' work, that association no longer held once the control variables of sex and

race were included. Literacy level was also unrelated to the number of hours worked per week. This study's finding that literacy level is unrelated to the number of hours worked per week is surprising considering the prior research finding that adults with higher levels of literacy were more likely to be employed (Statistics Canada, & Organisation for Economic Co-operation and Development, 2011). The difference in findings may stem from the different measures used. The Statistics Canada survey measured the likelihood of an individual being employed full time over the 52 weeks prior to the survey, a measure that was different from that used in the current study. It is possible that literacy level is unrelated to hours worked but is negatively correlated with full time employment because employees with lower skills may need to work multiple part time, low wage jobs in order to make ends meet. Therefore, individuals with low literacy skills may be working long hours, but may be unable obtain full time stable employment at one location.

Furthermore, this study found no association between literacy level and overall level of emotional distress. Thus, the links among literacy, overall emotional distress, and the two indices of work performance did not indicate any evidence for emotional distress as a mediator between literacy and work performance. Overall, literacy level was not a significant factor for the indices of individuals' emotional and work functioning in this study.

The lack of significant findings in this study could be affected by the overall lack of emotional distress and low degree of emotional distress limiting productivity in the sample (see Table 5). The mean score on the emotional distress scale was approximately nine. With the lowest possible score on the emotional distress scale being five (indicating

little to no emotional distress) and the potential high being twenty, an average of nine indicates that the sample overall was experiencing little emotional distress. This overall low level of emotional distress may have limited the power of this study to reveal any links between emotional distress and both literacy and work performance. In addition, the mean score for the extent to which emotional problems limited productivity was 2.91. A score of three indicated that emotional problems did not limit productivity at all while a two indicated that work was limited a little. Thus, very few respondents in the sample were experiencing any problems at work due to emotional problems, and therefore this study had limited potential for uncovering correlations between problems at work and other factors.

This study's findings contrast with prior research indicating that lower levels of literacy have a significant negative impact on both health outcomes and work performance (Hoffman-Goetz, Meissner, and Thomson, 2009; Kutner, et al., 2007; Riddick, Sterling, Farmer, & Morgan, 1999; Robinson, Clames, and Bazargan, 2008; Sum, 1992; Sum, 2007; Weiss, Hart, & Pust, 1991). Considering the finding of the National Assessment of Adult Literacy (NAAL) that 43 percent of adults (93 million) have below basic or basic literacy skills (NAAL Key Findings, 2003), it is surprising that the nationally representative sample used in this study found no negative implications for having a low level of literacy. Adults at the basic or below basic literacy level have the skills to do simple, every day tasks using common place prose or one-step quantitative reasoning. At such a level of literacy, it would greatly hinder an individual's ability to perform more than basic tasks at a job, understand health information, and attempt to access community resources.

With all the challenges that low literacy levels place on daily functioning, one would expect the results of the present study to be consistent with prior findings that low levels of literacy affect both mental health outcomes and work performance, even if emotional distress does not serve as a mediator between low literacy and those areas of functioning. One possible explanation for differing results in relation to mental and emotional health is the fact that the mental health questionnaire was self-administered. Therefore respondents who were struggling with basic literacy tasks may not have answered written questions accurately. This explanation is supported by Sentell and Ratcliff-Baird's (2003) finding that comprehension of the written Beck Depression Inventory was negatively correlated with literacy level. Another possible explanation involves the limitations of the sample used in the present study. Although the present sample is technically a nationally representative one, some self-selection was still involved because respondents could choose to participate or opt out. It is possible that individuals with basic or below basic literacy skills would choose to opt out of a long term study because they are uncomfortable answering questions related to personal matters, are intimidated by the section of the study that is completed in written format, or are distrustful of research done by government institutions. As discussed above, the findings of this study may have differed from those of prior research in relation to work performance because of the measure used to operationalize work performance. More accurate data based on better operational definitions of the variables seem more likely to generate results that agree more closely with prior research.

Limitations of the Study

This study was limited by the data set that was used. There are few existing nationally available data sets of any type that include information about all three areas of importance to this study: literacy, mental health, and job performance. Other data sets were explored for their suitability for this study, including the NAAL and the Panel Study of Income Dynamics. However no studies besides the NLSY (both 79 and 97 versions) include all three variables needed for the study. Unfortunately the data collected for the NLSY, particularly for work performance, provide limited measures at best for the variables of this study.

The number of weeks worked on average at a job measures job stability to some extent, and is likely intertwined with work performance to a degree (someone who performs their jobs poorly probably will be let go from their positions or may quit). However it is a very indirect measure of job performance and could be confounded by an individual's field of work (e.g., construction work may become scarce in the winter). This index measured the amount of time working rather than the quality of the individual's work. Furthermore, given the extensive list of participants' possible occupations, it was not feasible to control for the degree to which a high level of literacy was relevant/needed for each individual's job(s). None of the questions in the NLSY asked the participants whether level of literacy skills is important in their work.

The other index used to measure work performance also was indirect, as it involved self-ratings that one's work performance had been compromised by (unspecified) emotional problems. The NLSY survey item specified neither the criteria for judging quality of one's work performance nor the characteristics of emotional

difficulties. The positive correlation found between self-ratings of overall emotional distress and self-ratings of emotional problems interfering with work might be due to shared method variance (rating oneself as having personal problems). It would have been preferable to independently ask employees and supervisors to evaluate the quality of the employees' performance of specific aspects of their jobs during a set period of time. No national data sets, to the knowledge of this author, exist that include such task-specific evaluations.

Another limitation of this study was not having a precise literacy level reported for all individuals. Literacy levels were reported as a percentile within three-month cohorts. Although this conveys an individual's relative level of literacy, it does not provide an exact level. Therefore, it is possible that literacy levels for individuals in the study were collectively fairly high or fairly low for all participants. Without knowing individuals' exact levels of literacy (such as those used by the NAAL—below basic, basic, intermediate, etc.), it is impossible to know survey respondents' true capabilities, but rather only their relative capabilities, which might not be adequate for good performance of some jobs. In addition, the literacy measure was administered approximately ten years before the data related to work performance and mental health were collected. Although that longitudinal aspect of the survey's design was a strength for identifying possible causal processes over time, it is possible that some respondents' literacy levels had improved or worsened over the time between the data collection points, reducing the associations found between literacy and both overall emotional distress and job performance.

Implications and Opportunities for Future Research

Although this study found little support for the hypothesized associations among literacy, emotional distress and job performance, this does not mean that such associations do not exist but rather that the available data and research questions that were examined may not have tapped the key processes through which literacy can influence individuals' functioning in the workplace. For instance, perhaps individuals with low literacy skills have only found (or are only able to find) jobs that require minimal literacy skills. As such, their literacy level may not affect their work performance, because there are few literacy demands made on them. However, such individuals could still be experiencing negative effects of their low literacy in some areas of their personal life (e.g., not being able to read a bus schedule), mental health (perceiving a low sense of self efficacy), and their potential for job advancement and increased earnings (i.e., low literacy impedes their ability to advance in their type of employment or develop new employment options). Because the association between literacy level and the extent to which emotional distress affected work reached the level of a trend, mental health, literacy, and work performance are worth exploring.

The few studies that have collected data on adult literacy and outcomes have found clear links between literacy and health outcomes and literacy and work performance. Unfortunately such studies are often limited by sample size. The most robust data related to adult literacy in the United States come from the National Assessment of Adult Literacy (NAAL), but little information is presented in that data set beyond individual literacy levels. According to the last NAAL from 2003, 43 percent of adults (93 million) have below basic or basic literacy skills (NAAL Key Findings, 2003).

Despite the probable broad economic, social, and political implications of so many Americans functioning far below a level that is possible, the development of adult literacy programs and a focus on factors that can affect literacy attainment commonly are ignored, with programs rarely funded at the level that is needed. Until we fully understand the serious negative effects of low literacy on physical and mental health problems, economic loss, and social isolation, adult literacy will likely remain a hidden epidemic in America.

In designing research on literacy level and its effects, investigators need to ask the right questions in order to collect the appropriate data and generate accurate and useful findings. The present study has highlighted serious limitations of data collection in widely used national data sets. The limitations of the NLSY data set in the areas of assessing literacy assessment and job performance are striking. A comprehensive data set should be developed that would include a nationally recognized test of adult literacy (such as the CASAS) that reports results as a specific level of literacy, not simply a percentile (because knowing that an individual's literacy level is at a particular percentile among the population does not indicate whether that level of literacy is adequate for effective functioning) (Gorman & Ernst, 2004). Information about study participants' occupations and employment histories should include questions about job satisfaction, career goals, specific literacy and other abilities needed to conduct one's job effectively, opportunities for advancement, supervisor and employee evaluations of work performance, and employee tenure. In addition, information should be collected regarding mental health, including depression, anxiety, self-esteem, trauma histories, and learning disorders.

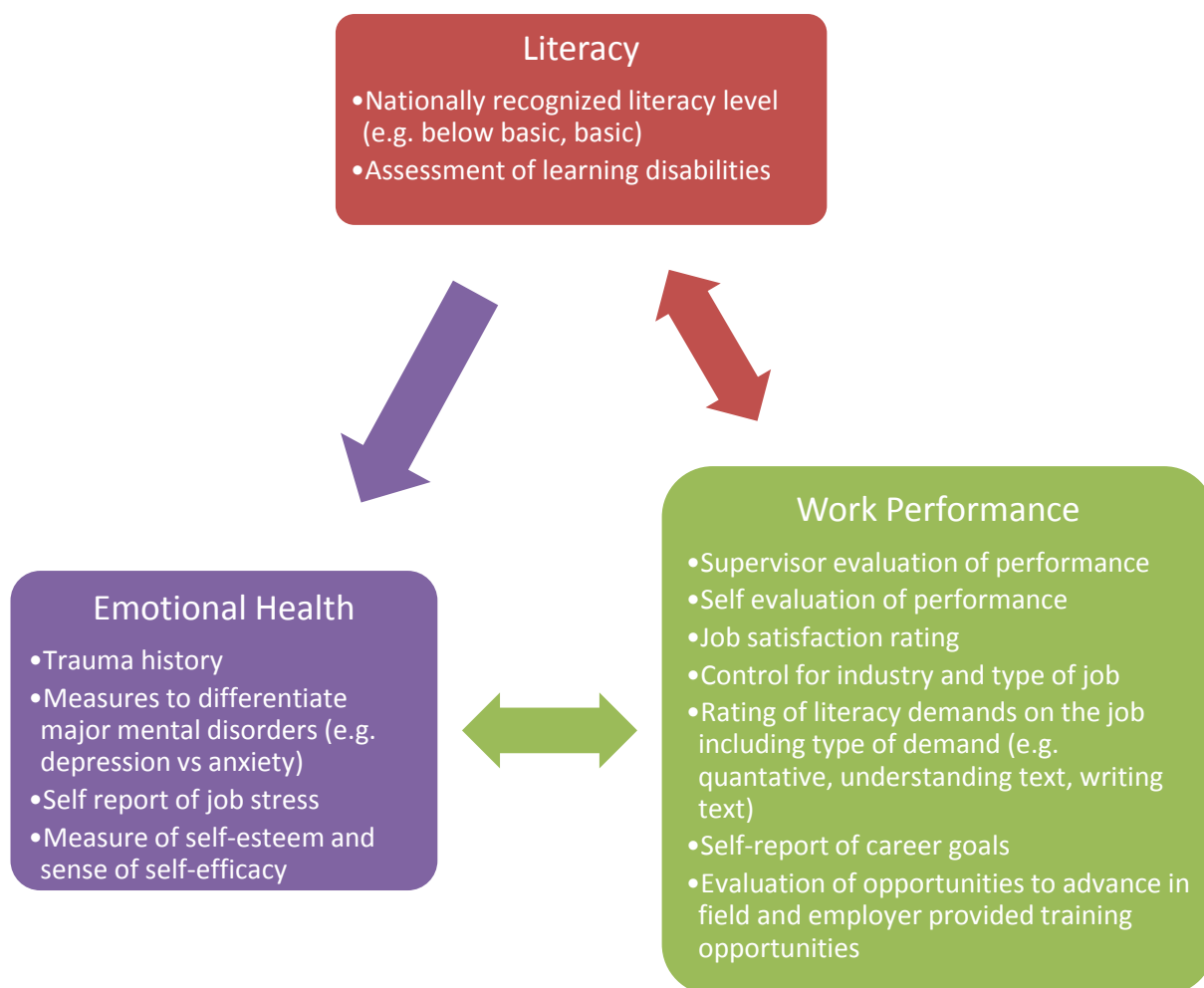
A number of changes to the model that was tested in this study could be considered for future research in order to better capture the complex relationships among literacy, mental health, and job performance (see Figure 2). For literacy a measure should be used that provides a specific literacy level (e.g. NAAL assessment, CASAS). In addition, to assess the extent to which learning disabilities may play a role in poor functional literacy, a learning disabilities assessment should be completed for each respondent. A number of additional factors should be considered in assessing emotional health. The relationship between literacy and mental health may be bidirectional (i.e., mental health problems early in life may lead to low literacy, and low literacy skills may lead to mental health challenges). Consequently, a model that includes such bi-directional effects should be tested. Nevertheless, because literacy and mental health challenges commonly co-exist among adults, research on interventions should target both problems. A focus should remain on the impact that increasing literacy levels could have on improving mental health, not only on interventions focused on improving mental health.

Because of the limited measures used in this study, it was not possible to differentiate between specific types of mental health issues, and this could be relevant because of the different types of interventions that may be effective. Symptoms experienced due to prior life traumas may be alleviated through different therapeutic interventions than symptoms experienced from depression or anxiety.

To better evaluate work performance, much more detailed information is needed than was available in the NLSY97 data set. First of all, specific evaluations from both the supervisor and the respondent are needed in order to evaluate quality of work and not simply time at work. In addition, the job satisfaction of the respondent should be

considered because although a person may have all the necessary skills to perform a job well, if their level of satisfaction is low, they may not be performing the job as well as they are able. Along with this, a rating of the literacy demands for the respondent's job should be used. Researchers could simply ask what portion of the time the respondent must use literacy skills and what types of skills are needed (e.g., making change at a cash register, writing reports). In addition, the industry and type of job in which the individual is employed should be taken into account. The culture and expectations of different industries vary widely (e.g., construction vs. human services) and create very different literacy demands that could affect results. Finally a measure of career goals, opportunities to advance in the respondent's field, and availability of employer-provided training should be included to examine if low literacy skills prevent employees in advancing their careers in the way they would like.

Figure 2. Proposed Model and Measures for Future Research



One possibility for conducting such a study would be to obtain a sample from a large organization that employs a variety of individuals in multiple pay levels and skill levels. For instance, hospitals employ not only doctors, nurses, and health care administrators who are highly educated, but phlebotomists who have technical training and food service workers who often have few requirements for employment. As a place of employment, a hospital likely already has a protocol for employee review (such as employee self-evaluations and supervisor written evaluations). A study could use already

created employee reviews along with a literacy measure and self-report questionnaires related to mental health, schooling, job satisfactions, and opportunities for advancement. Employee responses would be kept confidential, but a potential limitation of the study is employee fear that their answers would be released. Because an employer could benefit from the results of the study by receiving recommended interventions that could improve employees' work performance (such as workplace literacy classes or therapeutic interventions for depression and anxiety through an employee assistance program), such incentives might allow the study to be conducted with minimal difficulty regarding funding and finding a readily available sample.

Finally, well-designed studies regarding literacy interventions and outcomes are needed. In their randomized clinical trial, Weiss et al. (2004) found intriguing results that literacy interventions decreased depression symptoms and maintained the decrease for longer than individuals in their control group. They accessed a sample of 70 adult patients from a community health center who screened positive for depression and low literacy, and randomly assigned them to a treatment group and control group. Patients in the control group (mean age = 43.7, 87.5% Caucasian) were given standard treatment for depression from their primary care provider, while the treatment group (mean age = 41.3, 97.4% Caucasian) received the same care from their primary care provider and also participated in a literacy intervention program. Depression severity in the two groups was similar at baseline, but at the second and final follow up the intervention group had significantly lower scores than the control group (Weiss, et al., 2004). The study was limited by the number of participants and the lack of diversity in the sample; however, the findings suggest that interventions that increase literacy skills can improve an

individual's life in a way that helps them control or prevent depression symptoms (perhaps through an increase in self confidence). With growing emphasis on the importance of wrap-around services in social service agencies that target a range of client needs, interventions that combine foci on health, education, work, and basic needs like housing are increasingly logical and efficient. Existing health or education programs should maintain awareness of clients who may benefit from additional interventions beyond those that the immediate agency provides. Wrap-around programming could be incentivized for participants by providing small stipends and/or transportation money to those who actively attend programs.

With more findings like those of Weiss et al. (2004), government and philanthropic funds could be channeled in directions that could be remarkably effective—addressing education, health, and economic development simultaneously. For instance, an effective adult literacy program can enable students to achieve a higher level of literacy (and ideally a high school diploma or more). When an individual's level of literacy is higher, he or she is better able to access and use information that is useful in daily life, such as understanding a flyer with information about low cost counseling services. With increased ability to access resources, the individual will tend to have better health outcomes. In addition, with more advanced literacy skills, an individual will be better qualified for employment (particularly if he or she moves from not having completed high school to having a high school diploma or GED). Once gainfully employed, the individual will require fewer social services (e.g., TANF) and will thus use less taxpayer money—and will in fact contribute to the tax base and therefore benefit the community.

Renewed interest in adult literacy and its wide ranging impact is necessary before more research regarding adult literacy will be funded or more resources will be granted to adult literacy programming. In the opinion of the author of the present study, two main factors limit interest in funding adult literacy. One factor is a widespread lack of awareness of the depth and breadth of the problem. Few people realize that nearly half of the American population has very limited literacy abilities. It is often assumed that because the country has a low overall rate of illiteracy (inability to identify and decode words), this means that all adults have literacy skills sufficient enough to function well. Until there is greater awareness of the rate of functional illiteracy (inability to use literacy skills to assist in daily life), the need for adult education will remain a silent problem. A second barrier to interest in adult literacy is a belief that adults already had their chance at schooling and that granting funding to educate those who earlier in life were unsuccessful in existing schools is a waste of money. If adult education is considered a waste of money, so will spending money to provide housing, food, and related items to individuals who are unable to obtain employment because of their lack of skills or credentials be considered to be poor investments. Agencies at various governmental levels in the United States can continue distributing funds primarily to provide directly for people's basic needs, or programs also can be funded that help individuals achieve self-sufficiency. It seems prudent to start by providing funding to create robust, generalizable research related to adult literacy so that we can more fully understand and explain the consequences and possible solutions to this issue.

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