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Orientation and Mobility Skills, Outcome Expectations, and Employment for Youth with Visual Impairments: Findings from the National Longitudinal Transition Study-2

A thesis submitted in partial satisfaction

of the requirements for the degree of Master of Arts

in Education

by

Jennifer Lynn Cmar

2014

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ABSTRACT OF THE THESIS

Orientation and Mobility Skills, Outcome Expectations, and Employment for Youth with Visual Impairments: Findings from the National Longitudinal Transition Study-2

by

Jennifer Lynn Cmar

Master of Arts in Education

University of California, Los Angeles, 2014

Professor Connie L. Kasari, Chair

Identification of factors associated with positive transition outcomes for youth with visual impairments is essential in developing an understanding of this population's low employment rates. The aim of this study was to investigate factors associated with post-school employment outcomes in a nationally representative sample of youth with visual impairments through secondary analysis of data from the National Longitudinal Transition Study-2. Multiple logistic regression analyses were conducted to investigate the probability of future employment based on independent travel skills and outcome expectations. Results indicated that youth with higher ratings on community travel skills were more likely to be employed up to 6 years after high school, and youth with higher outcome expectations were more likely to be employed up to 8 years after high school.

The thesis of Jennifer Lynn Cmar is approved.

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2014

DEDICATION

I dedicate this thesis to my husband, John, for believing in me no matter what and for keeping me grounded. You are my rock. I also dedicate this thesis to my daughter, Audrey, for helping me see the brilliance in life, even on the cloudiest of days. You are my sunshine.

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Orientation and Mobility Skills, Outcome Expectations, and Employment for Youth with Visual Impairments: Findings from the National Longitudinal Transition Study-2

In the United States, approximately 37% of working-age adults with visual impairments are employed, compared to 76% of adults without disabilities (Erickson, Lee, & Von Schrader, 2012). Findings from a secondary analysis of data from the National Longitudinal Transition Study-2 (NLTS2) revealed a similar discrepancy in employment rates among young adults, with 38% of young adults with visual impairments employed versus 73% of young adults without disabilities (McDonnall, 2010a). McDonnall (2010a) also reported that 64% of adolescents with visual impairments attended postsecondary schools, as compared to 60% of those without disabilities. As evident by these figures, the high percentage of adolescents with visual impairments who participate in postsecondary education does not necessarily lead to increased involvement in the workforce. Investigation of factors associated with employment for individuals with visual impairments is a vital step in better understanding the low employment rates of this population.

The transition from high school to adulthood has been an ongoing topic of interest for professionals involved in the education and rehabilitation of students with disabilities, including those with visual impairments. One method of exploring this phenomenon is through secondary analysis of the NLTS2 dataset, which provides a national perspective of how these students fared during and after high school. The definition of visual impairment used in the NLTS2, and therefore used throughout this paper, is *an impairment in vision (including low vision and blindness) that, even with correction, adversely affects a child's educational performance* (IDEA, 2004). The NLTS2 included a nationally representative sample of students receiving special education services who were 13 to 16 years old in 2000 (SRI International, 2000).

According to SRI International (2000), data collection from families, youth, and school personnel took place over five time periods, or waves, between 2000 and 2009. Through the NLTS2 dataset, researchers have identified a number of factors associated with employment for transition-age students with visual impairments (e.g., see McDonnall, 2011; McDonnall & O'Mally, 2012; and Wolffe & Kelly, 2011), yet few studies have examined independent travel skills and youth expectations as predictors of employment.

Individuals with visual impairments learn independent travel skills through orientation and mobility (O&M) instruction. Specifically, O&M is the teaching of individuals with visual impairments the concepts, skills, and techniques necessary for safe, efficient, and graceful travel under all environmental conditions (Jacobson, 1993). The acquisition of independent travel skills is essential for students' participation in academic, nonacademic, and extracurricular aspects of education, in addition to fostering self-esteem, and social and economic independence (Riley, 2000). Self-efficacy, people's judgments of their abilities to control life events and outcomes, also plays a role in the transition to adult roles, including post-school employment (Bandura, 1989). Based on the work of Bandura (1988, 1989), the consideration of outcome expectations may lend additional insight into the study of employment outcomes for young adults with visual impairments.

A more comprehensive picture of the factors contributing to later employment outcomes is needed to improve outcomes for adolescents with visual impairments as they transition to adult life. Thus, the aim of the present study is to investigate associations between O&M, outcome expectations, and post-school employment outcomes in a nationally representative sample of young adults with visual impairments through secondary analysis of data from the NLTS2.

The Expanded Core Curriculum

Professionals in the field of blindness and visual impairment recognize that children with visual impairments require instruction in areas beyond the general curriculum. Historically, children with visual impairments who only received specialized instruction in the form of curriculum adaptation were not adequately prepared for adult life (Hatlen, 1990). The knowledge that children were graduating from high school with gaps in knowledge in areas directly related to their vision loss led to the development of the Expanded Core Curriculum (ECC) as a supplement to the core curriculum (Hatlen, 1996).

Through instruction in areas of the ECC, students with visual impairments receive individualized training in the following nine areas: (a) compensatory skills, (b) career education, (c) independent living skills, (d) O&M skills and concepts, (e) recreational and leisure skills, (f) social interaction skills, (g) self-determination skills, (h) assistive technology, and (i) sensory efficiency skills (Hatlen, 1996; Sapp & Hatlen, 2010). The ECC is the predominant model of successful instruction designed to meet the unique needs of students with visual impairments, and ECC-related instruction is incorporated into students' schedules and Individualized Education Plans (IEPs; Sacks & Rothstein, 2010; Sapp & Hatlen, 2010). Yet, little empirical research exists to document the ECC's effectiveness and its role in the transition to adulthood. The following sections include a discussion of factors related to many areas of the ECC; however, this study primarily focuses on O&M.

Theoretical Framework

Bandura's (1986) Social Cognitive Theory proclaims that a combination of personal, environmental, and behavioral factors interact in a bidirectional manner to influence human functioning. These interrelated factors do not necessarily have equal influence on human

behavior; some aspects may exert stronger influence than other aspects (Bandura, 1989). Since its origination, Social Cognitive Theory has been applied to various domains, including career-related behavior. According to Lent, Brown, and Hackett's (1994) Social Cognitive Career Theory, the related aspects of self-efficacy, outcome expectations, and goal representations influence career interest, choice, and performance.

Self-efficacy beliefs are vital in determining "the choices people make at important decisional points" (Bandura, 2006, p. 4). Thus, self-efficacy beliefs can influence choices made during the transition from adolescence to adulthood. Perceived efficacy beliefs, combined with skills and competencies, are crucial for success and goal accomplishment (Bandura, 1988). According to Bandura (1988) "people with the same skills may, therefore, perform poorly, adequately, or extraordinarily, depending on whether their self-beliefs of efficacy enhance or impair their motivation and problem-solving efforts" (p. 279). Self-efficacy beliefs contribute to the attainment of competencies and successes in many realms, including employment (Bandura, 1989).

With the absence of a unified theory of O&M for individuals with visual impairments (Welsh, 2010), the broader concept of Social Cognitive Theory aligns with the underlying framework of this study. The transition from school to work is a multidimensional process that cannot be explained by a single domain; therefore, the current study uses principles of Social Cognitive Theory and Social Cognitive Career Theory to examine relationships between outcome expectations and independent travel skills and later employment outcomes for young adults with visual impairments.

Transition from Adolescence to Adulthood

Adolescence is a normative developmental process, characterized by personal growth through mastery and other enabling experiences (Bandura, 1986). The transition from adolescence to adult roles is a complex, multifaceted process. According to Schlossberg (1981), "a transition can be said to occur if an event or non-event results in a change in assumptions about oneself and the world and thus requires a corresponding change in one's behavior and relationships" (p. 5). This broad definition of transition includes major life changes such as graduating from high school, childbirth, marriage, and entry into employment, as well as anticipated events that may not occur, such as not being accepted to postsecondary school or the inability to find gainful employment (Schlossberg, 1981).

Many individuals with disabilities, including those with visual impairments, require support for successful transitions to post-school adult life. Accordingly, the 1990 amendments to the Individuals with Disabilities Education Act (IDEA) mandated transition services for students with disabilities. The 2004 reauthorization of IDEA describes the transition process as an individualized, results-oriented process that includes a set of coordinated activities for children with disabilities. The emphasis of transition services is to improve the academic and functional achievement of children with disabilities, facilitating movement from school to post-school activities. One key aspect of this process is the provision of related services, including O&M instruction.

O&M services are defined in IDEA as "services provided to blind or visually impaired children by qualified personnel to enable those students to attain systematic orientation to and safe movement within their environments in school, home, and community" (34 C.F.R. § 300.34(c)(7)). More specifically, IDEA mandates instruction in the following areas, as

appropriate for each student: (a) spatial and environmental concepts; (b) use of information received by the senses to establish, maintain, or regain orientation and line of travel; (c) use of the long cane or a service animal; (d) use of remaining vision and distance low vision aids; and (e) other concepts, techniques, and tools. O&M instruction in community settings is fundamental for individuals with visual impairments to learn skills necessary for independence. Optimal instruction may be hindered by several factors, including time constraints (Lohmeier, Blankenship, & Hatlen, 2009) and liability concerns (Marsh, Hartmeister, & Griffin-Shirley, 2000).

Employment Status of Young Adults with Disabilities

Despite efforts to improve transition services for all students with disabilities, employment outcomes vary by primary disability categorization. Among young adults with disabilities, individuals with speech and language impairments, learning disabilities, and other health impairments were the most likely to be employed after high school (Newman et al., 2011). In contrast, young adults with multiple disabilities, autism, orthopedic impairments, deaf-blindness, intellectual disabilities, and visual impairments were significantly less likely to engage in post-high school employment.

Young adults with visual impairments graduate from high school and attend postsecondary school at high rates. In fact, these individuals are as likely or more likely to attend postsecondary school compared to individuals in the general population (McDonnall, 2010a). Despite their high rates of postsecondary education, individuals with visual impairments are less likely to be employed than individuals in the general population during high school, while attending postsecondary school, and after graduation (McDonnall, 2010a). Although 78% of

these individuals were employed at some point after high school, only 44% were employed at the end of NLTS2, up to 8 years after high school (Newman et al., 2011).

Factors Associated with Employment

Identifying factors contributing to positive employment outcomes for young adults with visual impairments is an essential step in better understanding the low employment rates of this population. The following section begins with a synopsis of predictors of employment for young adults with visual impairments, followed by a more detailed examination of O&M and its relevance to employment for youth with visual impairments.

An Overview of Employment Predictors

Factors associated with employment outcomes for young adults with visual impairments were investigated in several recent studies using large national datasets. Despite methodological differences, some significant variables were noted across studies. Prior research has indicated that the following vocational factors were related to employment for this population: (a) early or prior work experiences (Giesen & Cavenaugh, 2012; McDonnall & Crudden, 2009; McDonnall, 2010b, 2011; McDonnall & O'Mally, 2012), (b) number of recent work experiences (McDonnall & Crudden, 2009; McDonnall, 2011; McDonnall & O'Mally, 2012), (c) career counseling or job placement services (Giesen & Cavenaugh, 2012; Wolffe & Kelly, 2011), and (d) length of longest prior job (McDonnall & O'Mally, 2012).

Few studies have examined employment outcomes related to areas of the ECC. Despite some evidence that students who received ECC instruction actually had lower post-school outcomes (Monson, 2009), results of various studies have linked several areas of the ECC to positive outcomes for young adults with visual impairments. These areas included (a) O&M (McDonnall, 2011; Wolffe & Kelly, 2011), (b) use of assistive technology (Giesen &

Cavenaugh, 2012; Wolffe & Kelly, 2011), (c) independent living skills (Monson, 2009), and (d) self-determination (Giesen & Cavenaugh, 2012; Monson, 2009). Variables related to the ECC examined in prior studies included a combination of services provided and skill ratings.

Other significant predictors of employment outcomes for this population included (a) postsecondary education (McDonnall, 2010b, 2011), (b) health (McDonnall, 2010b), (c) parental support (McDonnall, 2010b), (d) math and verbal aptitude (McDonnall & Crudden, 2009; McDonnall, 2010b), and (e) locus of control (McDonnall & Crudden, 2009). In addition, transportation difficulties (McDonnall, 2011), having complete blindness versus low vision (Giesen & Cavenaugh, 2012), receiving remedial services (interpreter, reader, personal attendant, or remedial training) (Giesen & Cavenaugh, 2012), and receipt of Supplemental Security Income (Giesen & Cavenaugh, 2012; McDonnall & O'Mally, 2012) were negatively associated with employment.

Collectively, the findings outlined in the prior section suggest that numerous employment-related factors are important to consider for adolescents with visual impairments. Some of these predictors have been studied less frequently, with several studies yielding inconsistent results. Findings from a recent qualitative study indicated that professionals identified O&M skills, such as navigating public transportation, as fundamental for successful transitions from school to work (Crudden, 2012); yet an examination of the recent body of outcome research in this area revealed that factors related to O&M have been studied sparsely. Thus, the significance of O&M warrants closer consideration.

A Closer Examination of O&M

An NLTS2 report described adolescents' receipt of O&M services (Cameto & Nagle, 2007). According to Cameto and Nagle (2007), students who attended specialized schools

serving students with disabilities were more likely to receive O&M services than those in other educational settings. High school students with total blindness were more likely to receive O&M services than those with low vision. This discrepancy may be explained by perceived or actual differences in need between the two groups. Results of a Delphi study focusing on identifying O&M content appropriate for children with visual impairments suggested that experts felt that children who are blind require instruction in more O&M skills and concepts than children with low vision (Wall Emerson & Corn, 2006).

Cameto and Nagle (2007) also reported O&M performance ratings. These O&M skills were rated on a 3-point scale and included travel with a human guide, indoor and outdoor travel using rotely learned routes, creating new routes, following directions to travel in familiar and unfamiliar areas, use of numbering systems, room familiarization, and soliciting assistance in various environments. Students who are blind scored significantly lower than those with low vision on 9 of 10 O&M skills. In addition, students with additional disabilities rated lower than those without additional disabilities on 8 of 10 skills.

These findings from the NLTS2 study provided a national picture of differences in O&M service provision and skill performance. At the time of the report by Cameto and Nagle (2007), individuals in the NLTS2 sample were attending high school; therefore, associations between these O&M skills and later employment outcomes could not be examined. Thus, the present study builds on these findings by investigating relationships between O&M skills in high school and later employment outcomes.

In several recent studies, associations between O&M skills, O&M services, and post-school outcomes were investigated. Using a subsample of NLTS2 participants who were not attending postsecondary school, Monson (2009) examined relationships between areas of the

ECC and quality of life outcomes up to 4 years post-high school. Surprisingly, results indicated that most areas of the ECC, including O&M services and skills, did not significantly predict post-school outcomes. The present study examined employment outcomes 2 to 4 years later using a broader sample of NLTS2 participants.

Other NLTS2 analyses painted a slightly more positive picture of the specialized services provided to students with visual impairments. Wolffe and Kelly (2011) examined relationships between receipt of ECC services and engagement in employment, volunteer activities, and postsecondary education up to 6 years after high school. Significant relationships were found between receipt of O&M services and participation in employment or postsecondary education up to 4 years after high school, but not 2 years later (in Wave 4). In addition, students with complete blindness who used braille and received O&M services were more likely to be employed up to 6 years after high school.

McDonnall (2011) examined factors related to employment for individuals with visual impairments who were no longer attending high school or postsecondary school. Results indicated that independent travel skills predicted full-time, but not part-time, employment up to 6 years post-high school (McDonnall, 2011). Additional analysis is needed to investigate relationships between O&M skills and employment outcomes up to 8 years post-high school. Furthermore, inclusion of additional aspects of community travel may better represent the construct of independent community travel.

Building on the studies described in the prior section, examination of outcome data from Waves 4 and 5 of NLTS2 could provide a more complete picture of the employment outcomes of young adults with visual impairments up to 8 years after high school. Thus, the aim of this study is to investigate associations between O&M skills, outcome expectations, and employment

outcomes in a nationally representative sample of youth with visual impairments through secondary analysis of data from the NLTS2.

Research Questions

1. How do youth with visual impairments rate on campus travel skills, community travel skills, and outcome expectations?
2. What are the employment rates of youth with visual impairments up to 8 years after high school?
3. Do campus travel skills, community travel skills, and outcome expectations predict employment up to 6 years after high school for youth with visual impairments, controlling for age, level of vision, and additional disabilities?
4. Do campus travel skills, community travel skills, and outcome expectations predict employment up to 8 years after high school for youth with visual impairments, controlling for age, level of vision, and additional disabilities?

Method

Study Sample

NLTS2 included approximately 11,270 adolescents from 12 federally identified disability categories who received special education services. Approximately 1,000 students were sampled from each disability category, including visual impairment. Participants were 13 to 16 years old and in at least 7th grade in December 2000 when the study began (SRI International, 2000a). All sample sizes presented in the following sections were rounded to the nearest 10, per requirements of the U.S. Department of Education.

The NLTS2 study was designed to yield a nationally representative sample of students with disabilities who received special education services. To accomplish the goal of national

representation, NLTS2 used a two-step stratified random sampling process. First, Local Education Agencies (LEAs) were stratified by (a) geographic region, (b) student enrollment, and (c) socioeconomic status (SES) of school districts (SRI International, 2000a). Students were also sampled from state-run specialized schools for students with hearing and visual impairments. Approximately 500 LEAs participated in the study, as well as 40 specialized schools. Second, students were selected randomly from rosters provided by LEAs and specialized schools to represent each of the 12 disability categories. School districts determined students' eligibility for special education services under each primary disability category. Disability groups with low incidence populations (e.g. visual impairments and deaf-blindness) were oversampled to ensure adequate numbers for analyses. Sampling weights were devised so that findings from NLTS2 analyses generalize to students with disabilities across the nation and to students in each disability category. For a detailed description of the sampling plan, see Wagner, Kutash, Duchnowski, and Epstein (2005).

Data for the present study were drawn from students in the NLTS2 database. The analysis sample was restricted to youth who: (a) had a primary disability of visual impairment, (b) had data from at least one *School Program Survey,* and (c) had data from at least one *Parent/Youth Survey*. At the time of the *Wave 1 Parent Survey*, youth (unweighted $n = 510$) ranged in age from 14 to 18 years old. The majority of participants had low vision (68%) and did not have a diagnosed secondary disability (66%). Table 1 contains demographic information about the participants.

Data Collection Procedures

NLTS2 data collection took place over five time periods between 2001 and 2009. Multiple data sources were used, and data were collected from parents, students, teachers, and

school administrators. Variables included in the present study were extracted from the NLTS2 database from the *School Program Survey* and *Parent/Youth Survey*. Independent variables were taken from Wave 1 (2000-2001) and Wave 2 (2002-2003), and dependent variables were taken from Wave 4 (2006-2007) and Wave 5 (2008-2009).

The *School Program Survey* was sent by mail to a special education teacher or another individual who was most familiar with each student's program. This survey acquired information about each student's overall school program, such as general education classes, special education classes, transition planning, educational goals, transition goals, school performance, and service provision.

The *Parent/Youth Survey* consisted of structured phone interviews with parents and youth, conducted by trained interviewers using computer assisted telephone interviewing. Interviews were 45 to 60 minutes long and covered a range of topics, including (a) student characteristics, (b) household characteristics, (c) family involvement, (d) personal and social factors, (e) academic performance, (f) employment, (g) health, (h) responsibilities, and (i) satisfaction with school and employment. Interviews incorporated computer-assisted skip logic, where participants were asked only relevant questions. A mail survey was sent to those who were unable to participate by telephone. Phone interviews and mail surveys with parents and youth were similar in content; however, parent mail surveys were shorter in length. Mail surveys used a simpler form of skip logic and were customized for each participant whenever possible.

Measures and Variables

Variables from the NLTS2 database that best represented the constructs of interest were selected for inclusion in the present study. The demographic variables listed in Table 1 were chosen from the *Wave 1 Parent Survey* to obtain information about the participants'

characteristics. The following section describes the NLTS2 variables used for analyses in the present study. Specific NLTS2 variable names are included in Table 2.

Campus travel. O&M skills in the campus environment were assessed using the 10-item *Teaching Age-Appropriate Purposeful Skills* (TAPS) campus environment checklist (Pogrund et al., 1995). NLTS2's advisory group recommended TAPS for use in NLTS2 due to the unavailability of a validated O&M measure for the skills of interest (Cameto & Nagle, 2007). School personnel rated students' performance on each of the following activities: (a) travel using a sighted guide to familiar locations; (b) travel indoors using rotely learned routes; (c) travel to various school areas or buildings using rotely learned routes; (d) create new routes between familiar places indoors; (e) execute a route, given a set of verbal directions, to an unfamiliar location within one building; (f) execute a route, given a set of verbal directions, to an unfamiliar location in another building; (g) locate an unfamiliar place by using numbering systems; (h) orient self to an unfamiliar room; (i) solicit help to orient self to a building; and (j) solicit help to orient self to a high school campus or to a workplace (Cameto & Nagle, 2007). Campus travel skills were rated on a three-point ordinal scale: 1 = *not very well*, 2 = *pretty well*, and 3 = *very well*.

Community travel. O&M skills in the community were evaluated using three items that represented students' overall independence in community settings. Based on parent-report, students were rated on their ability to do the following tasks on their own, without help: (a) get to places outside the home, like to school, to a nearby store or park, or to a neighbor's house; (b) use public transportation to get around town, like a bus or taxi; and (c) arrange a plane or train trip to go out of town. Community travel variables were measured on a four-point ordinal scale: 1 = *not at all well*, 2 = *not very well*, 3 = *pretty well*, and 4 = *very well*.

Youth expectations. Three youth-reported items were used to represent efficacy beliefs regarding future life outcomes. Youth rated their likelihood of eventually (a) getting a paid job, (b) earning enough money for self support without financial help from family or government benefit programs, and (c) living away from home without supervision. Responses were rated on a four-point ordinal scale: 1 = *definitely will*, 2 = *probably will*, 3 = *probably won't*, and 4 = *definitely won't.* For the present study, variables were reverse coded, so that higher scores represent higher expectations of ability.

Other variables. Parents provided information regarding level of vision and additional disabilities. Parents were asked, "with what physical, sensory, learning, or other disabilities or problems has [YOUTH] been diagnosed?" Parents were then asked, "any other disabilities or learning problems?" Two choices were provided to represent visual impairment: (a) *complete blindness* and (b) *visual impairment/partial sight*. A dichotomous variable was used to represent level of vision in this study, with complete blindness coded as 0 and visual impairment/partial sight (referred to as "low vision") coded as 1. A dichotomous variable was used to identify the presence of additional disabilities, with a value of 0 indicating one or more disabilities in addition to visual impairment and a value of 1 indicating no additional disabilities.

Employment outcomes. Data regarding employment outcomes were taken from a youth-reported item asked during Wave 4 and Wave 5. Specifically, youth were asked, "do you have a paid job now, other than work around the house?" Responses were recorded as a dichotomous variable, with values of 1 indicating current employment and values of 0 indicating unemployment.

Data Analysis

Preliminary Analysis

Preliminary analyses were conducted to examine descriptive statistics for each variable. To create the campus travel, community travel, and youth expectations scales, participants' scores for the skills in each category were summed. Cronbach's Alphas were calculated to assess the internal consistency of each scale. Frequencies of missing values for each variable and patterns of missing data were evaluated for the eight analysis variables. As shown in Table 2, missing data for individual variables ranged from 0% to 56%. Missing data patterns were non-monotone, with 43 unique patterns of missing variables. All cases had data for at least two of the eight analysis variables and 17% of cases had complete data.

Missing Data

Multiple Imputation (MI) was selected for use in the present study to account for the missing data for the analysis variables. The following section includes a rationale for the choice of MI among other available approaches, as well as a description of MI.

Rationale. MI was chosen among several methods for dealing with missing data. Complete case analysis (e.g. listwise deletion) was not a feasible option, as this method would restrict the sample to 17% of all available cases. Furthermore, analyzing complete cases would not produce inferences for the population of students with visual impairments (Yuan, 2010). Similarly, pairwise deletion was not used, as this method also produces biased results unless data are Missing Completely at Random (MCAR, Graham, 2012). Single imputation methods (i.e. mean substitution and regression) produce a single complete dataset by substituting one value for each missing value; however, these methods reduce variances and are typically discouraged (Graham, 2012; Yuan, 2010). Furthermore, single imputation methods do not account for the

uncertainty of the missing values and could result in biased parameter estimates (Yuan, 2010). MI is a flexible method that preserves means, variances, covariances, and related quantities (Graham, 2012). Thus, MI is the most appropriate approach to produce unbiased estimates that generalize to the population of interest.

Description. MI produces several complete datasets by substituting several missing values for each missing value (Rubin, 1987). The production of more than one complete dataset accounts for the uncertainty of the missing values, resulting in valid inferences (Yuan, 2010). According to Yuan (2010), MI produces a random sample of missing values, rather than attempting to estimate each missing value.

Final Analysis

A three-step process was used to analyze data using SAS statistical software (v9.2). The process, which is described in the following section, consisted of (a) imputing missing values to produce several complete datasets, (b) analyzing the datasets using standard statistical methods, and (c) combining the results.

Imputation. In preparation for final data analysis, MI was used to generate 40 complete datasets. First, auxiliary variables were chosen from the NLTS2 dataset to improve the accuracy of the imputation model (see Table 3 for details). The use of a longitudinal dataset provided the availability of auxiliary variables that were similar to the analysis variables, but measured in other waves. Variables of this nature are ideal for use in an imputation model, as they are typically highly correlated in longitudinal datasets (Graham, 2012).

Second, correlation analyses were conducted to verify the relationships between potential auxiliary variables and analysis variables. Auxiliary variables were selected for inclusion in the imputation model if correlations with analysis variables with missing data were at least .50

(Graham, 2012). As depicted in Table 4, correlations between the final auxiliary variables and the analysis variables ranged from .51 to .83.

Third, the SAS MI procedure was used to create the multiply imputed datasets by replacing each missing value with a random sample of probable values (Rubin, 1987; Yuan, 2010). In accordance with the guidance set forth by Yuan (2010) and Graham (2012), 40 complete datasets were generated. Imputed values were rounded only when necessary for analysis to minimize the introduction of additional random error (Graham, 2012). Thus, the four dichotomous variables (vision, additional disabilities, Wave 4 employment, and Wave 5 employment) were rounded and values were restricted to 0's and 1's. Skewed continuous variables were not transformed before imputing, as "conditionally normal imputation of a skewed variable can often produce acceptable estimates if the quantities being estimated are means, variances, and regressions" (von Hippel, 2013, p. 107).

Fourth, the time series and autocorrelation plots were investigated as a diagnostic measure. All plots appeared acceptable according to the guidelines provided by Graham (2012). As an additional measure of the stability of the MI estimates, the MI degrees of freedom (*DF*) were inspected (Graham, 2012). As depicted in Table 5, the *DF* were higher than the number of imputations, indicating that the MI estimates were stable.

Analysis. Next, the 40 imputed datasets were analyzed. Descriptive analyses were conducted to examine campus travel skills, community travel skills, youth expectations, and employment outcomes. Furthermore, these variables were examined by level of vision and additional disabilities. Correlation analyses were conducted to examine bivariate relationships between the independent variables and employment outcomes. Bivariate logistic regressions were conducted between all predictor and outcome variables prior to their inclusion in the

multivariate models. Two binomial multiple logistic regression analyses were conducted to predict the probability of employment during Wave 4 (up to 6 years after high school) and Wave 5 (up to 8 years after high school) of NLTS2 based on campus travel skills, community travel skills, and youth expectations. In both analyses, control variables included age, level of vision, and additional disabilities.

Adjustments were made to obtain accurate standard errors by adjusting for NLTS2's sampling design with SAS software through use of the SURVEYMEANS, SURVEYFREQ, and SURVEYLOGISTIC procedures. Results for all final analyses were weighted to provide estimates that generalize to students with visual impairments nationwide. Appropriate weights were chosen in accordance with guidelines provided by SRI International. Single-instrument weights were distributed with the initial release of the NLTS2 dataset and six additional cross-wave weights were released in 2013. According to SRI International, the cross-wave weights are appropriate for analyses using imputed data across multiple waves or data sources. The weight used in the analyses was *wt_AnyPYProg*, which was designed for use when youth included in the analysis have data for any wave of the parent/youth surveys and a school program survey.

MI Inference. The SAS MIANALYZE procedure was used to combine the results from the 40 imputed datasets. This procedure uses Rubin's Rules for MI Inference (Rubin, 1987) to produce point estimates of parameters and MI-based standard errors (Sinharay, Stern, & Russell, 2001; Yuan, 2010). The point estimate of a parameter is the average of the parameter estimate across all imputed datasets, and MI-based standard errors reflect both the typical sampling variability and the added variability resulting from the missing data (Graham, 2012; Rubin, 1987).

Results

Through secondary analysis of data from the NLTS2, the present study explored relationships between O&M skills, outcome expectations, and employment outcomes in a nationally representative sample of youth with visual impairments. Descriptive statistics and logistic regression results are included in the following section.

O&M Skills and Outcome Expectations

As shown in Table 6, the campus travel scale consisted of 10 items (a = .95) representing a student's ability to use basic O&M skills. For the full sample, the mean campus travel score was 24.26 (*S.E.* = .37). Among students with no additional disabilities, students with low vision had the highest scores (M = 26.71, *S.E.* = .40), and those with total blindness scored 23.61 (*S.E.* = .97). For students diagnosed with additional disabilities, students with low vision scored 22.36 (*S.E.* = .82), and students with total blindness scored 19.31 (*S.E.* = .93).

The community travel scale consisted of 3 items (a = .83) representing a student's ability to travel independently in the community. The full sample mean for community travel was 7.69 (*S.E.* = .21). Among subgroups, highest scores were found for students who had low vision and no additional disabilities (M = 8.75, *S.E.* = .24) and total blindness and no additional disabilities (M = 7.95, *S.E.* = .34). Scores were lower for students with low vision and additional disabilities (M = 7.03, *S.E.* = .32) and students with total blindness and additional disabilities (M = 4.75, *S.E.* = .53).

The youth expectations scale consisted of 3 items (a = .61) representing students' expectations and beliefs about their future independence. The mean for the full sample was 10.70 (*S.E.* = .11). Students with low vision and no additional disabilities had the highest scores (M = 11.21, *S.E.* = .09), followed by students with total blindness and no additional disabilities (M =

11.16, *S.E.* = .27), students with low vision and additional disabilities (*M* = 9.82, *S.E.* = .21), and students with total blindness and additional disabilities (*M* = 9.60, *S.E.* = .40). Table 7 contains a summary of campus travel, community travel, and youth expectations scores.

Employment Outcomes

Overall, less than half of young adults with visual impairments were employed in Wave 4 (37%) and Wave 5 (40%). As depicted in Table 8, a similar pattern was found across waves when examining employment by subgroup. Regardless of multiple disability status, youth with low vision had higher employment rates than youth with total blindness. Furthermore, employment rates for all subgroups were slightly higher in Wave 5 than in Wave 4.

Relationships between O&M Skills, Youth Expectations, and Employment

Table 9 depicts bivariate correlations between the predictor variables and the two outcome variables. The strongest correlations were found between community travel skills and Wave 4 employment ($r = .38$, $p < .001$), and youth expectations and Wave 5 employment ($r = .29$, $p < .001$). Two multiple logistic regression analyses were performed to determine if employment during Waves 4 and 5 of NLTS2 could be predicted by campus travel skills, community travel skills, and youth expectations, controlling for age, level of vision and additional disabilities.

Wave 4. Results of the preliminary logistic regressions indicated that the following two variables significantly predicted employment in Wave 4: (a) community travel ($B = .26$, $p = .001$) and vision ($B = .81$, $p = .03$). Subsequently, these variables were included in the multivariate model; however, vision was no longer significant. The final model included only community travel. The results indicated that youth with high community travel scores were significantly more likely to be employed in Wave 4. Table 10 shows that the coefficient for

community travel was equal to .26 (p = .001). Furthermore, for each one-unit increase in community travel skills, the odds of employment increased by 30%.

Wave 5. Results of the preliminary logistic regressions indicated that the following three variables significantly predicted employment in Wave 5: (a) youth expectations (B = .36, p = .03), vision (B = .81, p = .05), and campus travel (B = .09, p = .02). When these three variables were included in the multivariate model, campus travel and vision were no longer significant. The final model included only youth expectations. The results indicated that youth with high scores on the youth expectations scale were significantly more likely to be employed in Wave 5. Table 11 shows that the coefficient for youth expectations was equal to .36 (p = .03). Furthermore, for each one-unit increase in youth expectations, the odds of employment increased by 43%.

Summary

Youth with low vision and no additional disabilities had high scores in all areas, and these youth had the highest employment rates in Wave 4 and Wave 5. Youth with complete blindness and no additional disabilities also had relatively high scores on the campus travel, community travel, and youth expectations scales; however, these youth had employment rates of just 27% in Wave 4 and 31% in Wave 5. Overall, campus travel, community travel, and youth expectations scores were low for youth with additional disabilities, and youth with total blindness and additional disabilities had the lowest scores across all areas. When examining employment rates, youth with low vision had higher employment rates than youth who are blind in Waves 4 and 5, regardless of the presence or absence of additional disabilities. Furthermore, employment rates increased slightly between Wave 4 and Wave 5. The largest increase was 5% for the group with low vision and no additional disabilities, followed by a 4% increase for the group with complete

blindness and no additional disabilities. The smallest increases (1%) were noted in the two groups with additional disabilities.

Discussion

The findings support prior research indicating that independent travel skills are associated with employment (McDonnall, 2011). Collectively, the results highlight the importance of O&M instruction in community settings, thus providing support for provision of this instruction to school-age children and adolescents. Transition programs could emphasize community travel instruction for youth who lack confidence or practice traveling independently in community settings. Monson (2009) primarily focused on campus travel variables, thus this study's findings support his conclusions that these variables do not significantly predict employment when examined alongside other key variables.

Overall, scores on the youth expectations scale indicated that youth with visual impairments held relatively high expectations for the future. The findings suggest that good community travel skills and high outcome expectations predict employment for youth with visual impairments. Furthermore, youth with total blindness and youth with additional disabilities may need additional support during their transition to adulthood. Although more youth with visual impairments were employed during Wave 5 than Wave 4, low employment rates persist for this population.

This study had several limitations that should be kept in mind when considering the results. First, the best available representations of each construct were selected from the NLTS2 database, but these variables may not be the best indication of a student's skills. Second, several variables of interest were excluded from the analysis due to extensive missing data. Third, some

MI estimates were not reported due to the lack of agreed-upon statistical techniques for pooling results when *Rubin's Rules* are not appropriate.

An unexpected finding was that community travel skills and outcome expectations did not predict employment in both Wave 4 and Wave 5. Further research is needed to confirm these results, in addition to determining potential reasons for this discrepancy. Additionally, future studies could investigate the impact of postsecondary education on future employment and the relationship between O&M skills, outcome expectations, and postsecondary education.

NLTS2 included information regarding whether or not youth received O&M services during each wave. The dataset did not include details about the quality, content, or consistency of O&M instruction. Inquiry into O&M service delivery could provide insight into instructional factors that promote O&M skill development and future outcomes. Moreover, a closer examination of the construct of self-efficacy may lead to further understanding of factors associated with positive post-school outcomes. Future research can build on the strengths of NLTS2, such as its sample and scope, while providing greater depth of focus in areas such as O&M.

Table 1

Demographic Characteristics of Sample

Variable	%
Age	
14	16
15	20
16	25
17	27
18	11
Gender	
Male	49
Female	51
Race/Ethnicity	
White	63
African American	19
Hispanic/Latino	13
Other	4
Annual Household Income	
0-25,000	32
25,001-50,000	32
50,000 or more	36
Vision Level	
Completely blind	32
Low vision	68
Secondary disability	
Yes	34
No	66

Note. Weighted $n = 9940$.

Table 2

NLTS2 Demographic and Analysis Variables

Variable	NLTS2 Variable Name	Description	% Missing
Disability	w1_Dis12	Primary disability category	0
Gender	w1_Gend2	Gender (i.e., male or female)	.19
Income	w1_Incm3	Annual household income (i.e., $25,000 or under; $25,001 to $50,000; or over $50,000)	12.45
Age	w1_Age	Age at Wave 1	0
Race/ethnicity	w1_Eth6	Race/ethnicity (i.e., White, African American, Hispanic, Asian/Pacific Islander, American Indian/Alaska Native, Multi/Other)	.19
Vision level	np1B1a_04	Complete blindness, dummy coded	1.17
Additional disabilities	Np1SecDisab	Diagnosis of any additional physical, sensory, learning, or other disabilities, dummy coded (e.g., autism, deafness, learning disability, etc.)	1.95
Campus travel	npr1B6[a-j]*	Ability to perform 10 orientation and mobility tasks (e.g., travel using a sighted guide to all familiar locations, travel indoors using rotely learned routes, etc.)	45.91
Community travel	np2G3a_[e, f, h]*	How well youth does the following on his/her own without help: get to places outside the home, use public transportation to get around town, and arrange a plane or train trip to go out of town	32.30
Youth expectations	np2V1[2a, 3, 4]*	Expectations for the future (i.e., likelihood of getting a paid job, living independently without support, and supporting self financially)	55.84
Wave 4 employment	np4HasJob	Youth has a paid job at time of Wave 4 interview	41.05
Wave 5 employment	np5T1c_A4c	Youth has a paid job at time of Wave 5 interview	39.11

Note. * signifies created variables. Values for gender, income, and race/ethnicity were not imputed.

Table 3

Auxiliary Variables Used in Multiple Imputation

Variable	NLTS2 Variable Name	Wave	Description
Number of additional disabilities	np2NumAddDisab	2	Number of any additional physical, sensory, learning, or other disabilities (e.g., autism, deafness, learning disability, etc.)
Campus travel, Wave 2	npr2B6[a-j]*	2	Ability to perform 10 orientation and mobility tasks (e.g., travel using a sighted guide to all familiar locations, travel indoors using rotely learned routes, etc.)
Community travel, Wave 3	np3G3a_[e, f, h]*	3	How well youth does the following on his/her own without help: get to places outside the home, use public transportation to get around town, and arrange a plane or train trip to go out of town
Parent expectations	np1J[7, 9, 10]*	1	Parents' expectations of youth's abilities (i.e., likelihood of getting a paid job, living independently without support, and supporting self financially)
Wave 4 competitive employment	w4CompEmp	4	Youth was competitively employed during Wave 4
Wave 5 employment 2	Np5T1B_A4b	5	Youth worked for pay over the past 2 years

Table 4

Bivariate Correlations Between Analysis and Auxiliary Variables

Variable	Campus W2	Community W3	Parent Exp.	Number Add. Dis.	Competitive Empl. W4	Employment W5
Campus	**.78*****	.57***	.59***	-.37***	.38***	.19*
Community	.56***	**.77*****	.65***	-.41***	.43***	.27***
Youth Exp.	.34***	.39***	**.51*****	-.35***	.31*	.21**
Vision	.32***	.24***	.25***	-.12**	.21***	.13*
Add. Dis.	.45***	.45***	.52***	**-.83*****	.26***	.17**
W4 Empl.	.14	.33***	.29***	-.15**	**.53*****	.53***
W5 Empl.	-.01	.19**	.21***	-.12*	.39***	**.67*****

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 5

Multiple Imputation Variance Information

Analysis Variable	DF[a]	RIV[b]	FMI[c]	RE[d]
Campus Travel	239	.33	.25	.994
Community Travel	351	.17	.15	.996
Youth Expectations	104	.92	.48	.988
Vision	505	.01	.01	.999
Additional Disabilities	500	.02	.02	.999
W4 Employment	175	.49	.33	.992
W5 Employment	122	.75	.43	.989

Note. 40 imputations, converged in 63 iterations.
[a]Multiple imputation degrees of freedom.
[b]Relative increase in variance.
[c]Fraction of Missing Information.
[d]Relative efficiency.

Table 6

Items and Cronbach's Alphas for Scales

Scale	Alpha
Campus Travel	.95
Travel using a sighted guide	
Travel indoors using rotely learned routes	
Travel to school buildings using rotely learned routes	
Create new routes between familiar places indoors	
Travel to an unfamiliar location in a building	
Travel to unfamiliar location in another building	
Locate an unfamiliar place using numbering systems	
Orient self to a room	
Solicit help to orient self to a building	
Community Travel	.83
Get to places outside the home	
Use public transportation to get around town	
Arrange a plane or train trip to go out of town	
Youth Expectations	.61
Likelihood of getting a paid job	
Likelihood of supporting self financially	
Likelihood of living independently	

Table 7

Weighted Means by Vision and Additional Disabilities

Variable	Mean	SE	95% CI	Min.	Max
Campus travel					
Full sample	24.26	.37	23.54, 24.98	23.95	24.63
Low vision, No Add Dis	26.71	.40	25.92, 27.49	26.20	26.94
Low vision, Add Dis	22.36	.82	20.75, 23.98	21.22	23.34
Blind, No Add Dis	23.61	.97	21.70, 25.53	22.17	24.74
Blind, Add Dis	19.31	.93	17.49, 21.13	18.26	20.15
Community travel					
Full sample	7.69	.21	7.27, 8.11	7.56	7.88
Low vision, No Add Dis	8.75	.24	8.28, 9.22	8.49	9.01
Low vision, Add Dis	7.03	.32	6.40, 7.66	6.81	7.26
Blind, No Add Dis	7.95	.34	7.27, 8.62	7.79	8.18
Blind, Add Dis	4.75	.53	3.71, 5.79	4.51	4.94
Youth expectations					
Full sample	10.70	.11	10.48, 10.92	10.59	10.85
Low vision, No Add Dis	11.21	.09	11.04, 11.38	11.10	11.30
Low vision, Add Dis	9.82	.21	9.41, 10.24	9.58	10.04
Blind, No Add Dis	11.16	.27	10.63, 11.68	10.74	11.45
Blind, Add Dis	9.60	.40	8.82, 10.39	8.89	10.35

Note. Weighted $n = 9940$.

Table 8

Employment by Vision and Additional Disabilities

Subgroup	Employed		Unemployed	
	n	%	*n*	%
		Wave 4		
Low vision, No Add Dis	1670	45	2010	55
Low vision, Add Dis	490	35	930	65
Blind, No Add Dis	350	28	910	72
Blind, Add Dis	240	22	870	78
Full Sample	3660	37	6290	63
		Wave 5		
Low vision, No Add Dis	1840	50	1840	50
Low vision, Add Dis	510	36	920	64
Blind, No Add Dis	400	32	860	68
Blind, Add Dis	260	23	850	77
Full Sample	4000	40	5950	60

Table 9

Bivariate Correlations Between Predictor and Outcome Variables

Variable	Wave 4 Employment	Wave 5 Employment
Campus Travel	.13	.26***
Community Travel	.38***	.12
Youth Expectations	.06	.29***
Vision	.19***	.25***
Additional Disabilities	.15**	.17**
Age	.14*	.17**

Note. Weighted estimates.
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 10

Logistic Regression Results for Wave 4 Employment

Parameter	EST	SE	95% CI	*t*	*p*	Odds Ratio
Model 1						
Intercept	-6.88	3.12	-13.04, -.72	-2.21	.03	
Community travel	.25	.08	.09, .41	3.04	.003	1.28
Vision	.48	.39	.28, 1.24	1.24	.21	1.62
Age	.25	.17	-.08, .58	1.51	.13	1.28
Final Model						
Intercept	-2.60	.68	-3.95, -1.25	-3.81	.0002	
Community travel	.26	.08	.10, .41	3.31	.001	1.30

Table 11

Logistic Regression Results for Wave 5 Employment

Parameter	EST	SE	95% CI	*t*	*p*	Odds Ratio
Model 1						
Intercept	-4.52	1.87	-8.22, -.82	-2.42	.02	
Youth expectations	.33	.16	.02, .65	2.11	.04	1.39
Vision	.72	.40	-.07, 1.50	1.80	.07	2.05
Final Model						
Intercept	-4.32	1.83	-7.95, -.70	-2.36	.02	
Youth expectations	.36	.16	.04, .69	2.21	.03	1.43

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