☑ CEU Article

The Relationship Between Perceived Computer Competence and the Employment Outcomes of Transition-aged Youths with Visual Impairments

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Structured abstract: *Introduction:* The study reported here explored the relationship between the self-perceived computer competence and employment outcomes of transition-aged youths with visual impairments. *Methods:* Data on 200 in-school youths and 190 out-of-school youths with a primary disability of visual impairment were retrieved from the database of the first three waves (2001–05) of the National Longitudinal Transition Study–2. The relationship between the youths' self-perceived computer competence and having paid jobs was examined using binomial logistic regression, with other variables (gender, severity of vision loss, and multiple disability status) held constant. *Results:* For both the in-school and out-of-school youths, those with a high self-perceived computer competence were significantly more likely to have paid jobs than were those with a low self-perceived computer competence when gender, severity of vision loss, and multiple disability status were held constant. Moreover, for the in-school youths, those with multiple disabilities were significantly less likely to have paid jobs than were those with only vision loss when the other variables were held constant. *Discussion:* The findings indicate the importance of computer competence for youths with visual impairments to achieve successful transitions. *Implications for practitioners:* Computer training should be a key component of the vocational preparation of transition-aged youths with visual impairments. In addition, special attention should be given to youths with multiple impairments to help them catch up in both computer use and employment.

In almost any culture, employment is not only an important indicator of an adult's success; it is necessary to ensuring one's survival. However, individuals with visual impairments perpetually experience unemployment in much higher rates than those with typical visual functioning. For example, in 2009, among individuals aged 21–64 with a visual disability, 38.7% were employed compared with 76.8% without disabilities (Erickson, Lee, & von Schrader, 2011). Such a low employment rate seems to begin even as soon as the youths leave school. According to the Wave 5 data of the

National Longitudinal Transition Study–2 (NLTS2) (U.S. Department of Education, 2010), in 2009, only 47.2% of youths with visual impairments had been competitively employed in the prior two years. When the data were drawn from this particular sample, it had been up to eight years since the youths had left high school. This percentage was much lower than the average level of NLTS2 youths in all disability categories (70.1%).

Although there are many skills that individuals with visual impairments need to obtain competitive employment, using computers has become one of the most desirable skills for at least two reasons. First, computers are commonly used as an assistive device and provide unique benefits, such as increasing access to information and expanding social networks (Gerber, 2003; Presley & D'Andrea, 2009). Second, computers are used as a powerful tool in general. The ability to use them effectively, even at a basic level, has already become a prerequisite skill for employment (Green, Felstead, Gallie, & Zhou, 2007).

The importance of computer skills for employment is recognized by many individuals with visual impairments. Qualitative studies have documented that most participants with visual impairments who were successfully employed use computers in their daily work, emphasize the importance of their possession of computer skills, and show that computer use has had a profound positive impact on their lives (Crudden, 2002; Gerber, 2003; Hutto & Hare, 1997). However, the small samples of participants in these studies limited the generalizability of their findings to other individuals with visual impairments.

In considering the relationship between job performance and computer skills, one may predict that individuals with higher-level computer skills would outperform those with lower-level computer skills in their overall job performance. However, large-scale quantitative studies have not supported this prediction. In 1999, Leonard, D'Allura, and Horowitz conducted a follow-up study with 167 persons with visual impairments who had received Lighthouse vocational placement services during 1989 to 1994 to determine their employment status and identify predictive factors of employment, level of employment positions, and perceived underemployment. They found that although computer skill was a significant factor for both employment and level of employment during bivariate analyses, its effect was not significant during multivariate analyses. Specifically, when many other factors, such as school placement, technology training, low vision services, satisfaction with social contact, self-efficacy, and motivation to work were controlled, good computer skills did not predict employment success. This finding points to the complexity of factors that lead to successful job performance, which clearly involves other aspects, such as workers' preparation, individual disposition, and the ability to work with coworkers (McDonnall, 2011). Similarly, the sample used in the study limited the generalizability of its results to a larger population.

Some recent studies have investigated the relationship between the use of assistive technology and the employment outcomes of people with visual impairments (McDonnall, 2011; McDonnall & Crudden, 2009). For example, McDonnall (2011) examined factors that may be related to employment using the NLTS2 database and found that the use of technology was not a significant predictor of youths' employment performance. However, the federal definition of an assistive technology device is "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (Sec. 602, 20 USC 1401, § 300.5). NLTS2 used the following interview question to examine the use of technology by youths with visual impairments: "Does [youth] use assistive technology, such as voice synthesizers or software, to enlarge the size of the print on the computer screen?" Apparently, the umbrella term *assistive technology* covers a variety of assistive devices. It is difficult to obtain direct implications of the effect of computer use from findings on assistive technology in general.

With the increasing emphasis on evidence-based practices, more research on the effects of computer competence on the employment of people with visual impairments is needed. The study presented here focused specifically on computers, rather than on assistive technology in general. Instead of examining the participants' skills in using computer-related assistive software or hardware, the study focused on the participants' reports of their own overall competence in computer use as an indicator of their functional capability to use computers in any way they preferred and to accomplish whatever they needed to in their daily lives. The study explored the following two research questions using NLTS2's nationally representative samples of transition-aged youths with visual impairments:

1. With other factors held constant, including gender, the severity of vision loss, and multiple disability status, was there a significant relationship between self-perceived computer competence and having paid jobs by youths with visual impairments who attend secondary school?
2. With other factors held constant, including gender, the severity of vision loss, and multiple disability status, was there a significant relationship between self-perceived computer competence and having paid jobs by youths with visual impairments who had been out of secondary school one year or more?

Method

Data source

The data used in the study were retrieved from the database of NLTS2. Funded by the National Center for Special Education Research, the aim of NLTS2 was to provide a national picture of the educational performance and employment outcomes of transition-age youths with disabilities (SRI International, 2011a; Wagner, Newman, Cameto, & Levine, 2006). NLTS2 included a nationally representative sample of more than 11,000 youths aged 13–16 who were receiving special education services in Grades 7–12 in the 2000–01 school year. Its data were collected through five waves from 2001 to

2009 and from multiple sources, including assessments of youths, interviews and surveys of the parents and youths, and surveys of school staff members (SRI International, 2011a). Because of the availability of variables used in this study, data collected in the first three waves were used.

Participants

The NLTS2 youths who met the following criteria were selected for the study: They received special education services in the visual impairment category, had provided information on whether they had paid jobs in 2003 and 2004 in the Wave 3 parent-youth interview and survey in 2005, and had provided information on their perceptions of their own computer competence in the Wave 2 parent-youth interview and survey in 2003. Youths who met these criteria were the participants for research question 1 if they were in secondary school in 2004. Those who were out of secondary school at least one year by 2005 were the participants for research question 2 if they met these criteria.

Variables

For both research questions, the dependent variable was a dichotomous variable of whether or not the youths had any paid jobs from 2003 to 2004. Data for this variable were gathered in the NLTS2 Wave 3 parent-youth interview and survey (2005), in which the youths, separated into those in secondary school in 2004 and those out of secondary school for a year or more by 2005, were asked, "At any time during the past two years, did you do any work for pay, other than work around the house or a school-sponsored job? This could include babysitting or working for a neighbor."

The youths' perception of their own computer competence was an independent variable for both research questions. In the NLTS2 Wave 2 parent-youth interview-survey (2003), the following question was asked: "People have a variety of strengths and interests. How good would you say you are at using the computer?" A 4-point Likert scale was used, with 1 = "not good at all," 2 = "not very good," 3 = "pretty good," and 4 = "very good."

For each research question, three other independent variables were added as covariates: gender, severity of vision loss, and multiple disability status. All the data on these variables were obtained from related NLTS2 parents' and youths' responses to the interviews and survey. These variables were added because of their proven relationships with both computer use (DeBell & Chapman, 2006; Gerber & Kirchner, 2001) and employment performance (Bell, 2010; Doren, Gau, & Lindstrom, 2011; La Grow, 2004).

Gender and the severity of vision loss (blindness or low vision) were dichotomous variables. The NLTS2 youths who reported that they were completely blind were regarded as being blind. Others (who said they were visually impaired but not completely blind) were regarded as having low vision. Multiple disability status was a dichotomous variable (yes or no). In the NLTS2 interviews and survey, the youths were asked whether they had been diagnosed as having specific conditions or disabilities, including asthma, attention deficit disorder, autism or Asperger syndrome, complete blindness, cerebral palsy, deafness, deaf-blindness, Down syndrome, dyslexia, emotional disturbance or a behavioral

disorder, hearing impairment or hard of hearing, health impairment, learning disability, cognitive impairment, physical or orthopedic impairment, speech or communication impairment, spina bifida, traumatic brain injury, visual impairment, developmental delay, multiple disabilities, and other disorders. In this study, the youths who did not respond yes to conditions other than complete blindness or visual impairment were regarded as having no multiple disabilities. Others were regarded as having multiple disabilities.

Data analyses

To answer the research questions, we conducted two binomial logistic regression analyses. Each regression model included the four independent variables described earlier. Binomial logistic regression was chosen to answer the research questions because it allowed the analyses of relationships between the target independent variables and a dichotomous dependent variable with the effect of many other related factors controlled statistically (Miles & Shevlin, 2001).

To address the effect of NLTS2's cluster and stratified sampling process, we conducted the regression analyses for the research questions using the Complex Samples module of SPSS 17.0 (SRI International, 2011a, 2011b). To control for the inflation of a Type I error, in each regression analysis, we used the sequential Dunn-Sidák method with a family-wise alpha of .05. Before each regression analysis for the research questions, we checked bivariate relationships between self-perceived computer competence and each of the other three independent variables using multiple regression under the SPSS Complex Samples module, with computer strength as the dependent variable and gender, the severity of vision loss, and multiple disability status as the factors.

Results

Because NLTS2 is a restricted-use database, all unweighted sample sizes and degrees of freedom that are reported were rounded to the nearest 10. Therefore, all unweighted sample sizes, related percentages, and degrees of freedom were approximate values.

There were 200 (weighted $N = 3{,}407$) in-school youths for research question 1 and 190 (weighted $N = 4{,}951$) out-of-school youths for question 2. The distributions of all the variables are presented in Table 1. For both the in-school and out-of-school youths, bivariate relationships between self-perceived computer competence and each of the other three independent variables were examined. For both groups, the youths' perception of their own computer competence was not significantly related to either gender or the severity of vision loss. However, the relationship between computer competence and multiple disability status was significantly negative for both the in-school youths ($R^2 = .09$, $t = -4.33$, $df = 50$, $p = .000$) and out-of-school youths ($R^2 = .11$, $t = -2.68$, $df = 60$, $p = .009$). Youths with diagnosed conditions or disabilities in addition to their vision loss reported significantly lower computer competence than did those with only vision loss.

The results of the binomial logistic regression analysis for research question 1 are summarized in Table 2. Overall, the regression model was a good fit: Nagelkerke $R^2 = .36$, Wald F (4, 40) =

Table 1
Sample descriptive statistics.

School status	Samples	*n*	Had paid jobs? Yes (%)	Had paid jobs? No (%)	Self-perceived computer competence: Not good at all	Not very good	Pretty good	Very good	Gender: Male	Female	Severity of vision loss: Blindness	Low vision	Multiple disability status: Yes	No
In-school youths	Unweighted	200	70 (35)	120 (60)	20 (10)	40 (20)	80 (40)	60 (30)	120 (60)	80 (40)	70 (35)	120 (60)	120 (60)	80 (40)
	Weighted	3,407	1,801 (52.9)	1,606 (47.1)	299 (8.8)	457 (13.4)	1,090 (32.0)	1,561 (45.8)	1,980 (58.1)	1,427 (41.9)	1,225 (36.0)	2,182 (64.0)	1,827 (53.6)	1,580 (46.4)
Out-of-school youths	Unweighted	190	120 (63.2)	70 (36.8)	10 (5.3)	10 (5.3)	70 (36.8)	100 (52.6)	100 (52.6)	90 (47.4)	60 (31.6)	120 (63.2)	70 (36.8)	120 (63.2)
	Weighted	4,951	3,599 (72.7)	1,352 (27.3)	233 (4.7)	385 (7.8)	1,442 (29.1)	2,891 (58.4)	2,260 (45.7)	2,691 (54.3)	1,177 (23.8)	3,774 (76.2)	1,358 (27.4)	3,593 (72.6)

4.33, $p = .009$. The correlation matrix of all the independent variables was examined and indicated relatively low collinearity ($r < .47$). When gender, the severity of vision loss, and multiple disability status were held constant, the youths' perceptions of their own computer competence had a significant positive relationship with employment performance ($t = 3.00$, $p = .004$). In-school youths with higher self-perceived computer competence in 2003 were more likely to have paid jobs during 2003 and 2004. Multiple disability status was found to have a significant negative relationship with the youths' employment performance ($t = -3.24$, $p = .002$). The youths with diagnosed conditions or disabilities in addition to their visual impairments were less likely to have paid jobs than were those with only vision loss. The relationships between gender and the severity of vision loss and youths' employment performance were not statistically significant.

The results of the binomial logistic regression analysis to answer research question 2 are summarized in Table 3. As a whole, the model was not a good fit: Nagelkerke $R^2 = .11$, Wald F (4, 60) $=$ 2.71, $p = .149$. The correlation matrix for all the independent variables was examined and indicated relatively low collinearity ($r < .52$). Among all the independent variables, only self-perceived computer competence was found to have a significant relationship with the dependent variable of having a paid job ($t = 2.10$, $p = .040$). When all the other variables were held constant, the out-of-school youths with higher perceptions of their own computer competence in 2003

Table 2
Results of the logistic regression analysis with the in-school participants.

Independent variables	*B*	*t*	*df*	Adjusted *p*
Intercept	−3.61	−3.46	50	.001*
Self-perceived computer competence	0.88	3.00	50	.004*
Gender (male or female)	1.01	1.84	50	.072
Severity of vision loss (blindness or low vision)	0.74	1.68	50	.100
Multiple disabilities (yes or no)	−1.765	−3.24	50	.002*

* $p < .05$ after the sequential Dunn-Sidák adjustment.

were more likely to have paid jobs during 2003 and 2004.

Discussion

Using NLTS2 data and a multivariate approach, the study explored the relationship between the self-perceived computer competence and employment outcomes of transition-age youths with visual impairments. For both the in-school and out-of-school youths, those with high perceptions of their own computer competence were more likely to be employed than were those who thought they had low computer competence when gender, the severity of vision loss, and multiple disability status were held constant. These findings are congruent with the results of previous qualitative research that most individuals with visual impairments who are successfully employed emphasize their computer use (Crudden, 2002; Gerber, 2003; Hutto & Hare, 1997). The findings of this study provide support for the practice of computer training as a key component of the vocational preparation of transition-age youths with visual impairments.

However, these findings contradict the results of the aforementioned quantitative investigation by Leonard and colleagues (1999) that computer skill was not significantly related to employment and the level of employment of a group of adults with visual impairments who received Lighthouse vocational placement services from 1989 to 1994. It should be noted that the two studies targeted different subgroups of people with visual impairments and selected different independent variables for their regression analyses. In addition, the rapid advancement of computer technology and its continuously increasing impact on the job market over the years may have also contributed to the difference.

Table 3
Results of the logistic regression analysis with the out-of-school participants.

Independent variables	*B*	*t*	*df*	Adjusted *p*
Intercept	−1.63	−1.91	60	.060
Self-perceived computer competence	0.58	2.10	60	.040*
Gender (male or female)	−0.08	−0.20	60	.844
Severity of vision loss (blindness or low vision)	−0.67	−1.53	60	.132
Multiple disabilities (yes or no)	−0.31	−0.67	60	.508

* $p < .05$ after the sequential Dunn-Sidák adjustment.

Investigations with the general population have shown that competence in the use of computers is an advantage for gainful employment, which is congruent with the findings of our study. For example, studies have found that workers with computer skills earned more than did other workers (Green et al., 2007; Krueger, 1993; Pabilonia & Zoghi, 2005). Wheeler (2005) examined data from the Current Population Survey from 1983 to 2002 and found that the frequency of computer use was a significant factor that had widened the wage gap within industries. Moreover, the growth in computer-related jobs is a leading cause of upgrading workers' skills (Autor, Katz, & Krueger, 1998; Kim, 2002). Obviously, the use of computers has built a threshold for every job seeker, with or without disabilities.

Although the study did not examine in depth how youths' computer skills had facilitated their employment, it may actually happen in many ways. Aside from data that indicated that the current job market requires computer skills (Green et al., 2007), computer technologies can also help overcome certain employment barriers specific to visual impairments that have been documented by many studies for years, such as access to transportation and mobility, reading print, the lack of job-related information, and difficulties with job applications (such as filling out application forms) (Crudden & McBroom, 1999; Crudden, Sansing, & Butler, 2005; O'Day, 1999; Shaw, Gold, & Wolffe, 2007). For example, use of the Internet may decrease transportation demands and serve as an important information bridge for job seekers.

As both a general tool for all people and a type of assistive technology for individuals with functional challenges, computer technologies will continue to play a critical role in the employment of people with visual impairments. Future studies may further investigate specific job-related computer applications by individuals with visual impairments to provide guidance for vocational training. Especially when traditionally computer-based functions have been expanded to many other devices, such as iPads and smart phones, and accessibility features have been integrated into more and more such products, clear guidance about how to select and use these devices to promote employment outcomes for people with visual impairments is needed.

The study found that youths' perceptions of their own computer competence did not differ according to gender and the severity of vision loss, part of which seemed to contradict Gerber and Kirchner's finding (2001) that people aged 15 and older with severe vision loss used computers and the Internet less frequently than did those with less severe vision loss. The study also found that youths with additional disabilities reported significantly lower computer competence than did those with only vision loss, which seems to be congruent with Gerber and Kirchner's 2001 study. Using data from a 1999 federal survey, Gerber and Kirchner found that people with multiple impairments used computers and the Internet less frequently than did those with only visual impairments. The findings of the two studies should be compared with caution, given the different analytical approaches and criteria of vision loss that were used and the age groups that were investigated.

When asked about their computer competence, 77.8% of the in-school youths

and 87.5% of the out-of-school youths in this study answered either "good" or "very good", which seems to indicate that by 2003 most transition-aged youths with visual impairments in the United States already felt quite confident in using computers. The percentages between the two groups may differ because there was a larger portion of youths with multiple impairments in the in-school category (see Table 1). It is reasonable to assume that with the increasing availability and accessibility of computer technologies and their continuously expanding impact on people's lives, gaps in the use of computer technology by individuals with visual impairments, according to many demographic factors (such as gender and the severity of vision loss), can gradually phase out as young generations grow up. However, special assistance still seems to be needed to help students with multiple impairments catch up. Regarding computer competence, this subgroup of students are already behind their peers with only vision loss at the turning point toward adulthood.

Practical Implications

On the basis of the importance of computer competence to the successful transition from school to employment by youths with visual impairments indicated by the findings of this study, computer technology training for this population as part of their preparation for the transition to employment is supported. The findings also indicate that special attention should be given to youths with multiple impairments. For example, training and assistance for teachers of students with visual impairments in teaching technologies to students with multiple impairments should be strengthened, given the gap and need documented in other studies (Zhou, Parker, Smith, & Griffin-Shirley, 2011; Zhou, Smith, Parker, & Griffin-Shirley, 2011).

Limitations

First, the NLTS2 data that were used in this study were collected from 2003 to 2005, which may no longer reflect the present situation. Second, because the study did not use an experimental design, no causal relationships can be inferred. Third, the youths' self-perceived computer competence may not accurately reflect the youths' real computer capability. Last, the extensive use of categorical (especially dichotomous) variables in the study limits in-depth understanding of the issues that were investigated.

Future Studies

An understanding of how computer technologies are used for the purpose of employment by individuals with visual impairments, especially by those who are successfully employed, is needed for vocational computer training to be effective and efficient. In addition, future studies may explore whether there is a causal relationship between computer competence and employment outcomes for individuals with visual impairments. The findings of this correlation study cannot support any causal implications but can inform future experimental studies.

Conclusion

In a highly computerized society, the lack of computer competence can result in barriers in many aspects of people's lives, including employment. It is therefore not a surprise that for the transition-aged youths with visual impairments who were

investigated in the study, those who thought they had high computer competence were more likely to be employed than were those who rated themselves as having low computer competence. The results of the study not only support computer training as a key component of the vocational preparation of youths with visual impairments, but call for more attention to the development of students with multiple impairments. It is the goal and responsibility of our educational system to provide these youths with all the skills they need to achieve successful transitions.

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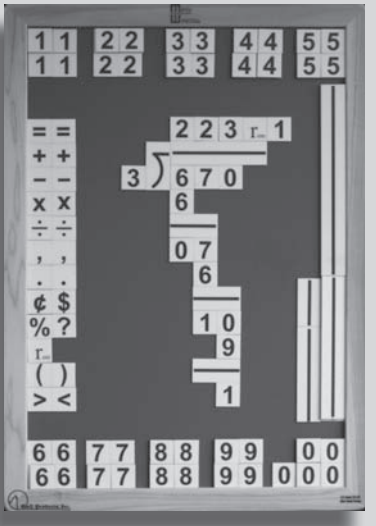

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