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Orientation and Mobility Skills of Secondary School Students With Visual Impairments

The Nature and Incidence of Visual Impairment

For the purpose of special education eligibility, federal regulations define visual impairment (including blindness) as "an impairment in vision that, even with correction, adversely affects a child's educational performance" (34 C.F.R. Sec. 300.8(c)(13)). Some states have elaborated on this definition by specifying minimum levels of visual acuity or a restriction in the visual field. Thus, a child may qualify as having a visual impairment in one state, but may not qualify in another. Children and youth with visual impairments are fewer than 0.5 percent of those aged 6 through 21 who are served under Part B of the Individuals with Disabilities Education Act (IDEA) (U.S. Department of Education 2007a). Recent data indicate that about 12,000 youth aged 12 through 17 receive special education services nationwide because their primary disability is a visual impairment (U.S. Department of Education 2007b).

Some research suggests that the federal child count underestimates the incidence of visual impairment. For example, the number of children and youth with visual impairments reported to the American Printing House for the Blind is more than twice that reported to the federal government (Hueber 2000). The discrepancy can be explained by the IDEA requirement that children receiving special education services be reported under only one disability category. This means that children with visual impairments who have additional disabilities may be categorized as having multiple disabilities or reported in another disability category rather than visual impairment. Data on the prevalence of children with visual impairments who have additional disabilities are limited (Sacks and Silberman 1998), but one estimate is that 50 percent to 75 percent of the children with visual impairments have additional disabilities (Silberman 2000).

Students with visual impairments are served in a variety of educational settings, including regular public schools and public or private separate facilities (e.g., state-operated special schools, residential facilities, and hospitals). However, receiving instruction in separate facilities has become less common over time. For example, in 1950, 88 percent of children with visual impairments

were educated in special schools, but in 1972, this figure had decreased to 32 percent (Lowenfeld 1981). Continuing this trend, 16 percent of students ages 12 through 17 who were served under IDEA Part B during the 1998-99 school year attended special schools (U.S. Department of Education 2001).

Regardless of setting, students with visual impairments "share one common characteristic—a visual restriction of sufficient severity that it interferes with normal progress in a regular educational program without some modifications" (Scholl 1986, p. 29). The level of severity has important implications for the degree of modification a student requires. In general, a child with low vision can usually be educated to some extent through his or her visual sense, whereas a child who is completely blind must be educated exclusively through tactile and other sensory channels. Thus, children and youth with visual impairments may receive a range of special education services, including training in orientation and mobility (Corn et al. 1995).

Orientation and Mobility Training

Orientation has traditionally been defined as the process of using the senses to establish one's position and relationship to other objects in the environment, whereas mobility refers to the capacity, readiness, and ability to move about in the environment (Hill 1986). Orientation and mobility training helps a person with a visual impairment know where he or she is in space and where he or she wants to go (orientation) and how to carry out a plan to get there (mobility). Orientation and mobility services are among the related services provided to eligible students as part of their individual education programs (IEP), with their focus being determined on the basis of an evaluation of the child by an orientation and mobility specialist. Because children exhibit a range of visual functioning, orientation and mobility instruction can encompass a range of content. Wall-Emerson and Corn (2006) found that experts differed regarding essential orientation and mobility skills for students with low vision compared with those for students who are blind.

A key feature of orientation and mobility training is that it takes place in natural environments, both inside and outside the school context (Allison and Sanspree 2006; Pierangelo and Giuliani 2004; Smith and Levack 1996). Mobility specialists typically place students in a real-world context and give them practical and age-appropriate problems to solve. Younger students may be asked to find their way to and around their school building, whereas older students may be taught to access community services, shop, arrange for and use public transportation, and find their way around their neighborhoods and business areas. Acquiring these kinds of "fundamental and enabling life skill(s)" (Huebner and Wiener 2005, p. 579), "like the acquisition of…academic and social skills, is of great importance to the social and economic independence of blind and visually impaired persons" (U.S. Department of Education 2000, p. 36590).

About This Report

Research Questions

Although instruction in orientation and mobility skills is an essential component of the educational experience of students with visual impairments, little is known about the provision of these services in public secondary schools nationally. What

percentage of secondary school special education students who are classified as visually impaired receive orientation and mobility services as part of their school program?[1] Does the receipt of such services vary with instructional setting? How well do youth classified as visually impaired perform on specific orientation and mobility tasks? Does the level of orientation and mobility skill vary with the presence of coexisting disabilities, level of severity of visual impairment, or demographic characteristics?

Data Sources

These questions are addressed by using data from the National Longitudinal Transition Study-2 (NLTS2) Student's School Program Survey, conducted in 2002.[2] At that time, students were 14 through 18 years old and were attending secondary schools in grades 7 through 12 or were in ungraded classrooms. School personnel who were most familiar with students' school programs[3] completed self-administered questionnaires about the students' characteristics, school programs, services, and performance. Data to identify the presence of a coexisting disability were taken from a list of disabilities indicated by school personnel in response to the request to "mark all of this student's disabilities." Additionally, if the student had a visual impairment, school personnel were asked to rate the student's orientation and mobility skills.

Basic demographic data and data to distinguish the level of students' severity of visual impairment are drawn from information provided by the students' parents or guardians during the NLTS2 parent telephone interview conducted in 2001, when students were 13 through 17 years old. During a telephone interview, respondents provided information about students' individual and household characteristics. Regarding disability characteristics, respondents were asked "With what physical, sensory, learning or other disabilities or problems has [the youth] been diagnosed?" Response options related to visual impairment were "blind" and "partially sighted."

The phrase "students with visual impairments" used in this report includes only students with visual impairment as their primary disability category, as reported to NLTS2 by the school district or special school and designated according to the criteria specified by each state. The

[1] NLTS2 does not specifically ask school respondents about the students' need for orientation and mobility services, only whether or not such services are received.

[2] The National Longitudinal Transition Study-2 (NLTS2), being conducted by SRI International for the U.S. Department of Education, has a nationally representative sample of students who were between the ages of 13 and 16 and in at least seventh grade and receiving special education services in the 2000-2001 school year. NLTS2 students were chosen from rosters of students receiving special education from or through public school districts and state operated special schools. These education agencies were instructed to include all students for whom they were responsible, regardless of where they went to school or the type of school attended (e.g., a residential school in another state). Approximately 820 youth with visual impairments were included in the initial sample that was designed and weighted to represent a total of 1,838,850 youth with disabilities and 11,610 youth with visual impairments in the NLTS2 age range nationally, according to federal child count figures (U.S. Department of Education 2002). The sample of students for this report are the students classified as visually impaired for whom the Student School Program Surveys was received (N=480). For more information about the study, including the sampling and analysis design, sample weighting, methods, and standard errors of estimates, see the study's website at www.nlts2.org.

[3] School personnel who were most familiar with students' school programs could include special education and general education teachers, related services personnel, case managers, school guidance counselors, and others. School personnel were asked, "Are you able to describe the school program for the student named on the cover [of the questionnaire]? If no, do not complete this questionnaire. Please pass it on to the school professional who is best able to describe the student's school program."

primary disability classification is central to the statistical weighting methods used in NLTS2, and including students in this report who had visual impairments but were assigned to other primary disability categories would have obscured the population to which the findings generalize. Thus, this report does not include students who had visual impairments but received special education services under other IDEA disability categories (i.e., for whom visual impairment was not the primary disability) or who did not receive special education services at all.

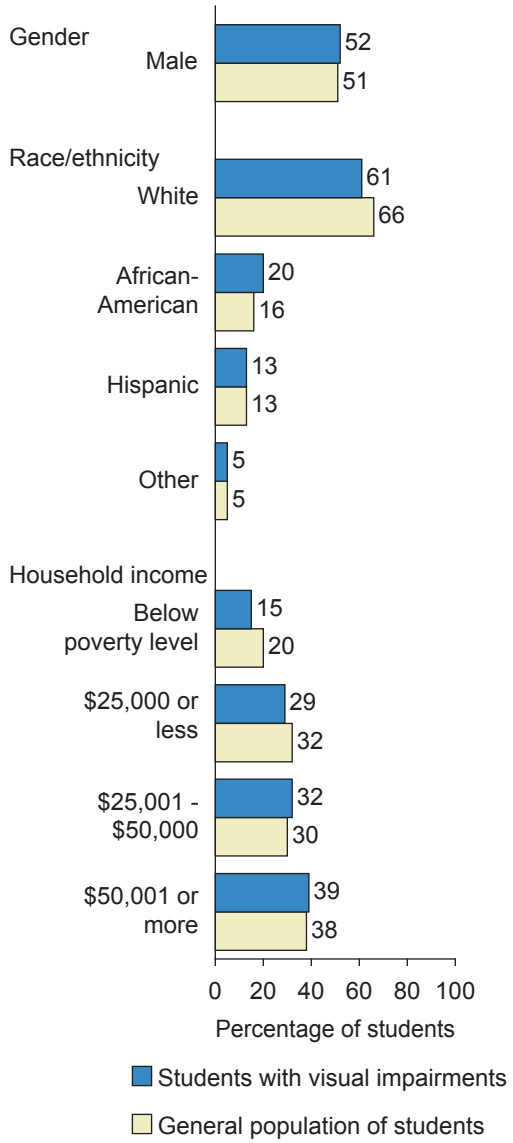
Demographics and School Settings

The demographic characteristics of students with visual impairments do not differ significantly from those of students in the general population (figure 1). Approximately half are male, 61 percent are white, 20 percent are African American, 13 percent are Hispanic, and 15 percent live in households with incomes below the poverty level.

School personnel reported that 60 percent of students in the category of visual impairment have no coexisting disabilities (figure 2); however, approximately 21 percent have one other disability, and 19 percent have two or more additional disabilities. The most common coexisting disabilities for students categorized as visually impaired are mental retardation and learning disabilities (41 percent and 37 percent, respectively, of students with visual impairments and coexisting disabilities). Parents reported that 28 percent of students in the category of visual impairment are blind and 72 percent are partially sighted (figure 3).

The majority of students categorized as having a visual impairment (81 percent) attend regular schools. These students are

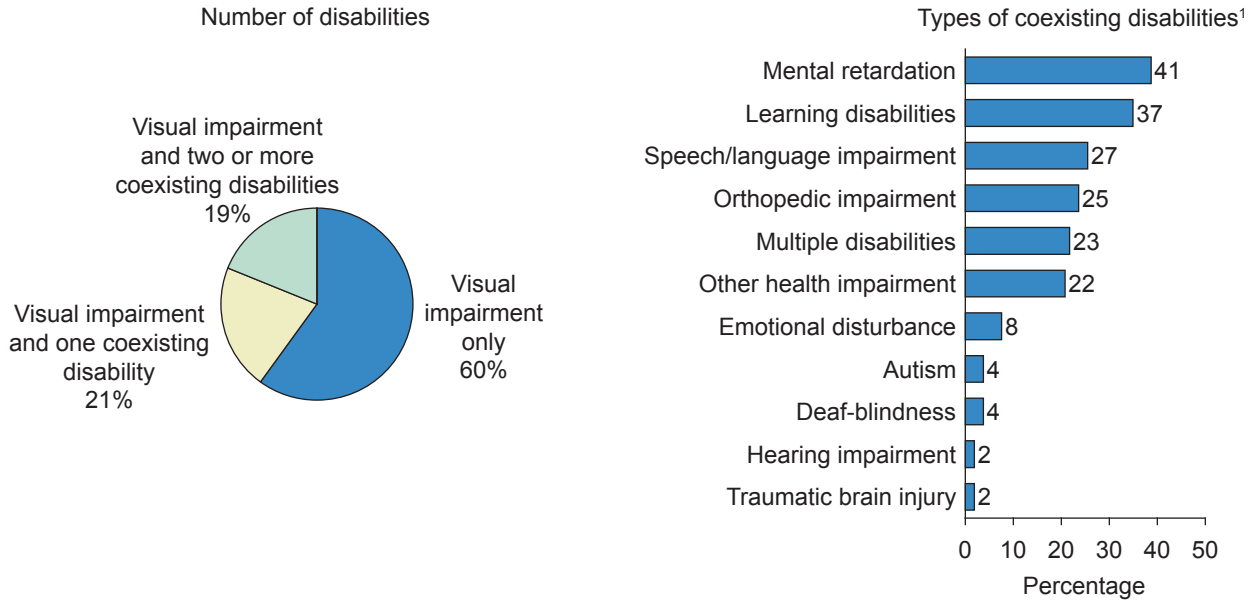
Figure 1. Selected demographic characteristics of students categorized as visually impaired and students in the general population



NOTE: Percentages are weighted national estimates.

SOURCES: U.S. Department of Education, Institute of Education Sciences, National Center for Special Education Research, National Longitudinal Transition Study-2 (NLTS2), student's school program survey, 2002; U.S. Department of Education, National Center for Educational Statistics, National Household Education Survey (NHES), 1999 parent survey; responses for youth ages 13-17 for general population of students.

Figure 2. The presence of coexisting disabilities for students categorized as visually impaired

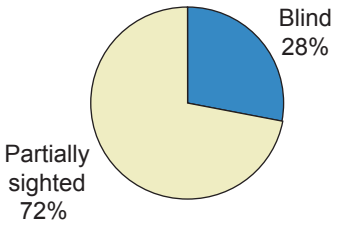


[1] Percentages are of students with visual impairments and coexisting disabilities.

NOTE: Percentages are weighted national estimates.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Special Education Research, National Longitudinal Transition Study-2 (NLTS2), student's school program survey, 2002.

Figure 3. The level of severity of impairment for students categorized as visually impaired

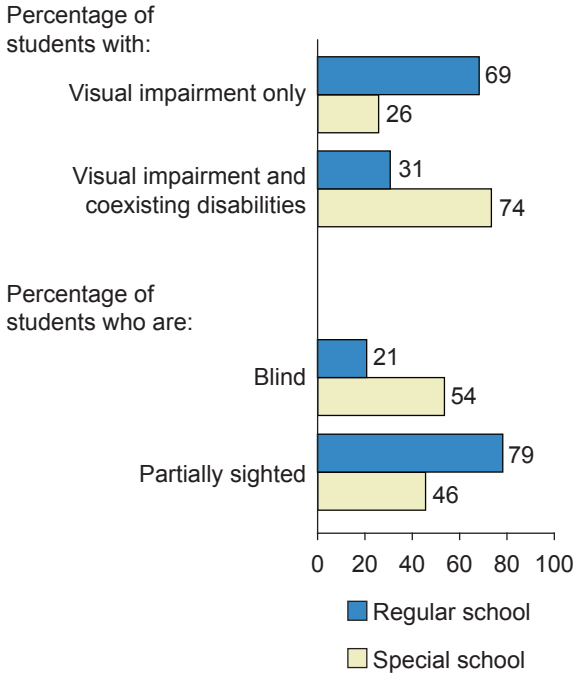


NOTE: Percentages are weighted national estimates.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Special Education Research, National Longitudinal Transition Study-2 (NLTS2), parent interview, 2001.

significantly less likely to have coexisting disabilities than students attending special schools serving only students with disabilities (31 percent vs. 74 percent, $p < .001$, figure 4).[4] Further, at special schools, the percentage of blind students is larger than at regular schools (54 percent vs. 21 percent, $p < .001$).

Figure 4. Disability characteristics of students categorized as visually impaired, by school placement



NOTE: Percentages are weighted national estimates.

SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Special Education Research, National Longitudinal Transition Study-2 (NLTS2), student's school program survey, 2002.

Receipt of Orientation and Mobility Training

School personnel who knew students well were asked to indicate whether "mobility training had been provided [to] this student from or through the school system during this school year (including services contracted from other agencies)."[5] They reported that 54 percent of youth with visual impairments receive such training. Students with visual impairments who attend special schools are significantly more likely to receive orientation and mobility training than students who attend regular schools (figure 5; 80 percent vs.

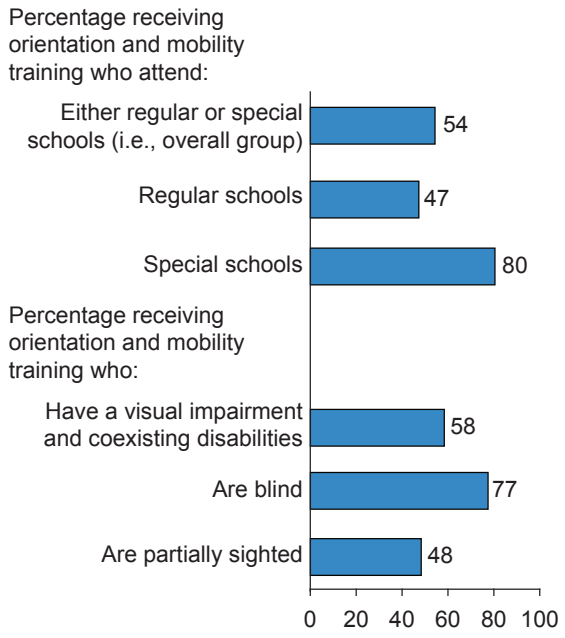
[4] In this report, tests of equality of proportions were performed to determine differences between groups and are highlighted only if the differences are statistically significant with at least 95 percent confidence (denoted as $p < .05$). Statistical tests examining differences between independent subgroups or between responses to different items given by the same group that involve categorical variables with more than two possible response categories were conducted by treating each of the possible response categories as separate dichotomous items. The test statistic used to compare Bernoullian-distributed responses (i.e., responses that can be allocated into one of two categories and coded as 0 or 1) for two independent subgroups is analogous to a chi-square test for equality of distribution (Conover 1971) and approximately follows a chi-square distribution with one degree of freedom. However, because the test statistic itself is more similar in form to the square of a two sample t statistic with unequal variances (Satterthwaite 1946), and because a chi-square distribution with one degree of freedom is the same as an F distribution with one degree of freedom in the numerator and infinite degrees of freedom in the denominator (Johnson and Kotz 1970), this statistic can be considered the same as an F value; it also can be considered "$\chi 2$". To calculate whether the difference between percentages are statistically significant, the squared difference between the two percentages of interest is divided by the sum of the two squared standard errors. If the resulting number is larger than 3.84, the difference is statistically significant at the .05 level—i.e., it would occur by chance fewer than 5 times in 100 (the approximate number of comparisons contained within this report). Presented as a formula, a difference in percentages is statistically significant at the .05 level if:

$$\frac{(P_1 - P_2)^2}{SE_1^2 + SE_2^2} > 1.96^2$$

where P1 and SE1 are the first percentage and its standard error and P2 and SE2 are the second percentage and the standard error. If the result of this calculation is 6.63 to 10.79, the significance level is .01, and products of 10.8 or greater are significant at the .001 level. No special adjustments were made to account for multiple comparisons. Given the number of comparisons made in this report, readers are cautioned to consider the possibility of false positives in interpreting the data.

[5] Receipt of mobility training and performance on orientation and mobility skills are the only variables related to orientation and mobility in the NLTS2 dataset. Thus, it is not possible to provide a description of the types of orientation and mobility services students receive.

Figure 5. Receipt of orientation and mobility training, by students categorized as visually impaired



NOTE: Percentages are weighted national estimates.

SOURCES: U.S. Department of Education, Institute of Education Sciences, National Center for Special Education Research, National Longitudinal Transition Study-2 (NLTS2), student's school program survey, 2002, and parent interview, 2001.

47 percent, $p < .001$). Students who are blind are more likely to receive orientation and mobility training than students who are partially sighted (77 percent vs. 48 percent, respectively, $p < .01$). There are no statistically significant differences in the receipt of orientation and mobility services associated with students who have coexisting disabilities or with their gender, age, grade level, race/ethnicity, or household income.

Orientation and Mobility Skills

School personnel who knew students in the category of visual impairment and their school programs well were asked to complete a checklist of selected items taken from Teaching Age-Appropriate Purposeful Skills (TAPS), developed by the Texas School for the Blind and Visually Impaired (Pogrund et al. 1995), portions of which were included in the NLTS2 student's school program survey.[6] TAPS is a comprehensive orientation and mobility assessment and curriculum for practitioners who work with children ages 3 through 21 who are blind or partially sighted. The assessment instrument was originally developed using the orientation and mobility manual from the Los Angeles Unified School District and revised by an advisory committee of orientation and mobility instructors from Texas who added functional mobility skills to the assessment and piloted the instrument. The assessment instrument is comprehensive in scope and may be used as an initial assessment of skills, to develop priority areas for instruction, and to document student progress. Both the assessment instrument and the curriculum are divided into five sections (home/living, the campus environment, the residential environment, the commercial environment, and public transportation) that reflect the key environments where students need orientation and mobility skills. The beginning of each section includes a list of functional mobility tasks, arranged from simple to most complex, that a student would perform in each specific environment. The TAPS assessment manual provides a 3-level rating criteria to use in assessing student performance (see below). The 10 mobility and orientation tasks[7]

[6] The TAPS checklist was recommended for use as part of the NLTS2 student's school program survey by the study's advisory group.

[7] School personnel who knew the student well rated the student on the following skills:

Travel using a sighted guide to all familiar locations.
Travel indoors using rotely learned routes.
Travel to other school areas or other buildings using rotely learned routes.
Create new routes between familiar places indoors.
Execute a route, given a set of verbal directions to an unfamiliar location within one building.
Execute a route, given a set of verbal directions to an unfamiliar location in another building.

represent a continuum of basic to more complex activities related to successful travel in the campus environment and are age-appropriate for the secondary school population (Pogrund et al. 1995).

The TAPS functional mobility tasks for the campus environment and the rating criteria were included in the NLTS2 student school program survey. Respondents were asked to report, "how well this student performs each of the mobility activities." Respondents selected one of the following response choices:

- "Not very well—can do the task only within a familiar routine when there is no novelty introduced, or needs a considerable amount of prompting to do it."
- "Pretty well—performs the task consistently in at least one setting or inconsistently but well in several settings."
- "Very well—performs the task well in many settings over a period of time."

Overall Orientation and Mobility Skill Levels and Variations by Disability Characteristics

Travel using a sighted guide to familiar locations. Most secondary school students with visual impairments (82 percent) are reported to be able to travel to familiar locations with a sighted guide very well (figure 6). There are no statistically significant differences between students who have visual impairments only and students with visual impairments and coexisting disabilities or between students with varying levels of visual impairment (blind vs. partially sighted).

Travel indoors using rotely learned routes. Eighty-two percent of students with visual impairments are reported to be able to travel indoors using rotely learned routes very well. Although no statistically significant differences exist between students with visual impairments only and those with coexisting disabilities, the difference between blind and partially sighted students in performing these skills very well is statistically significant. This skill is more difficult for students who are blind than for those who are partially sighted; 62 percent and 90 percent, respectively, are rated as performing the skill very well ($p < .01$).

Travel to various school areas or buildings using rotely learned routes. School personnel report that about three-fourths of students with visual impairments can travel very well to various school locations, such as the cafeteria, the auditorium, or the gym, using rotely learned routes (72 percent). Performance of this skill is significantly lower among students with coexisting disabilities compared with students with visual impairments only; 48 percent vs. 84 percent are rated as performing this skill very well ($p < .001$). Performance on this skill also is significantly lower among students who are blind compared with students who are partially sighted; 54 percent vs. 80 percent perform it very well ($p < .05$).

Create new routes between familiar places indoors. Sixty percent of students with visual impairments are reported by school personnel to be able to create new routes between familiar places indoors very well. Performance is lower among students with coexisting disabilities than

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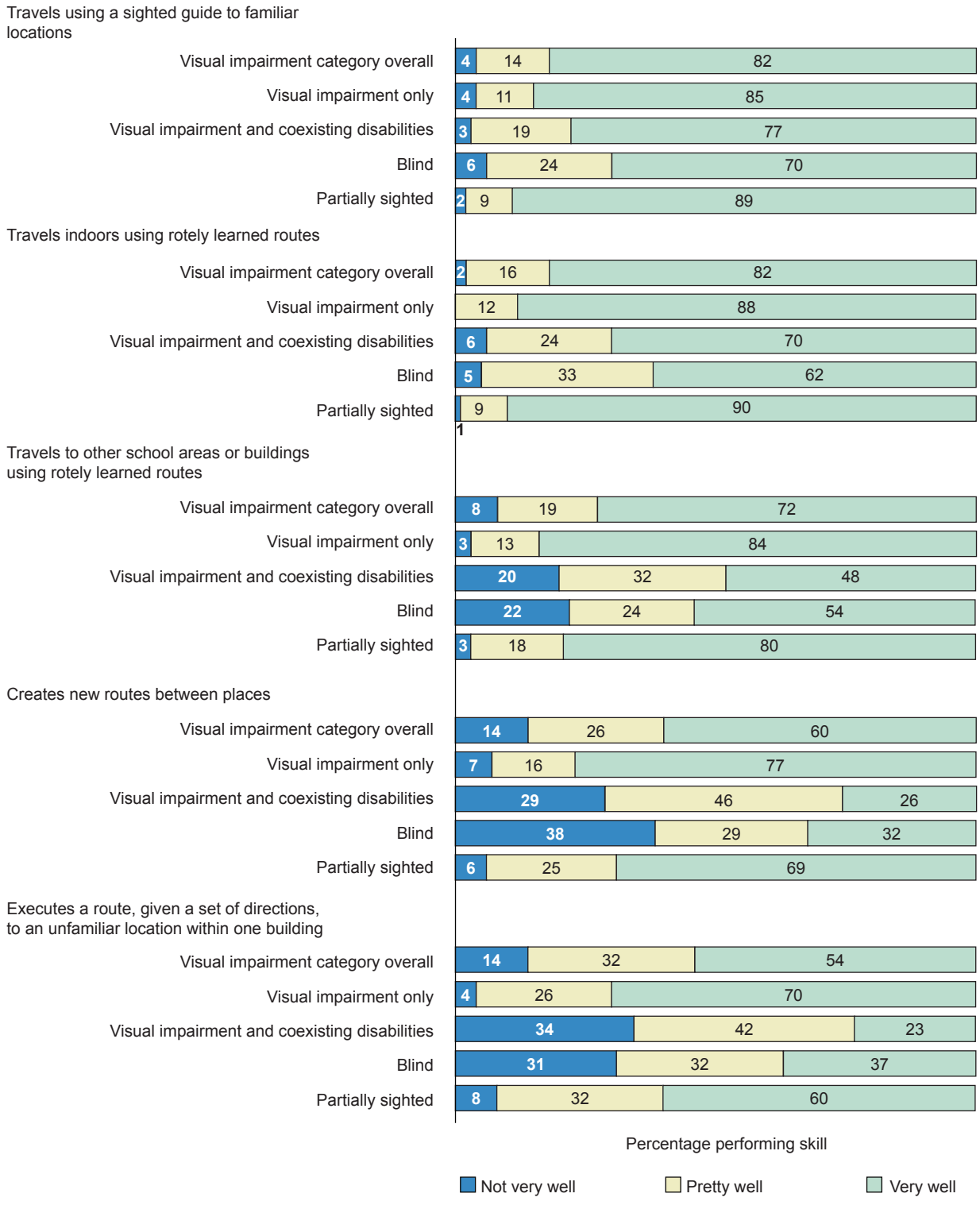
Locate an unfamiliar place by using numbering systems.
Orient self to an unfamiliar room.
Solicit help to orient self to a building.
Solicit help to orient self to a high school campus or to a workplace.

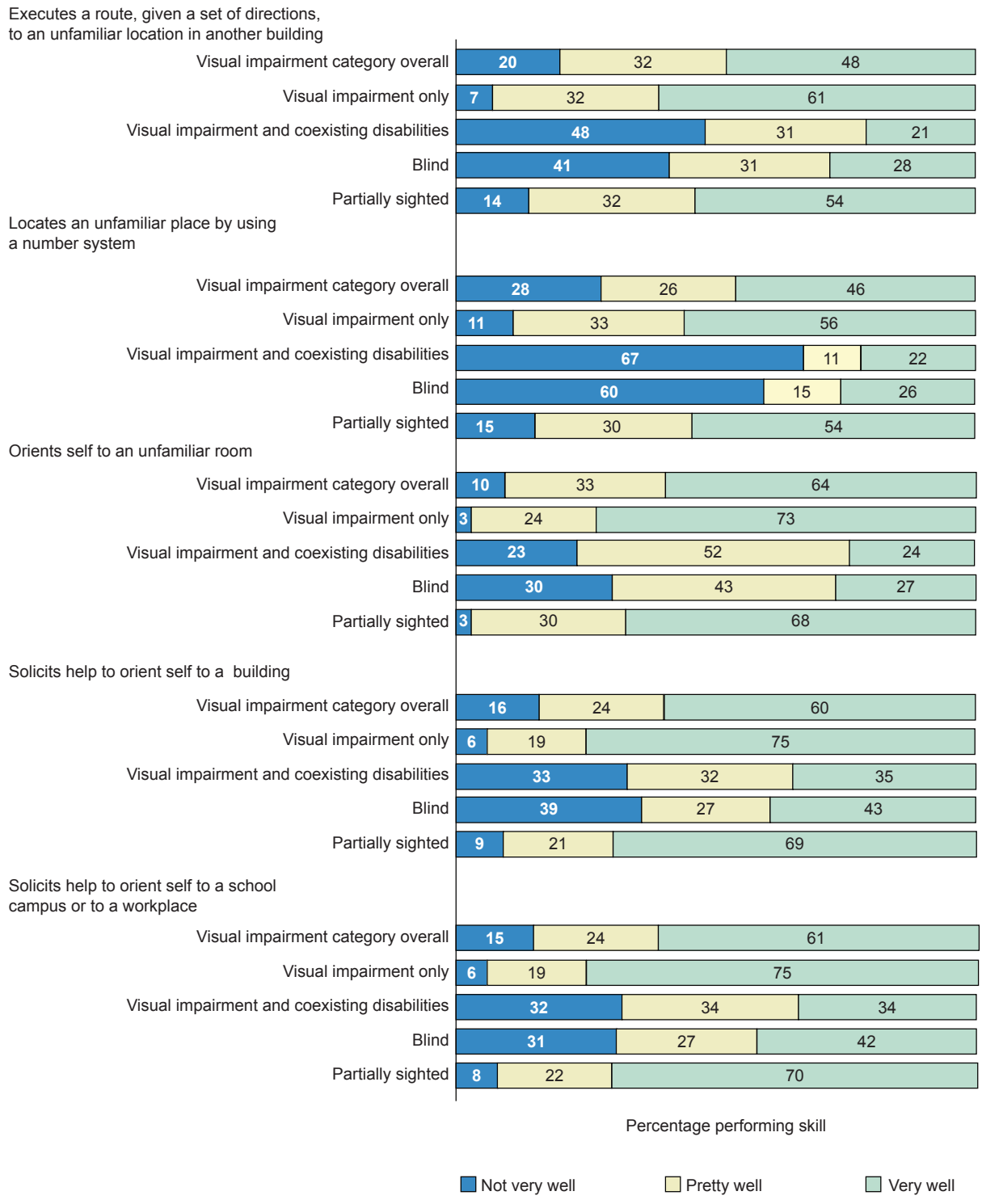
Figure 6. Orientation and mobility skills of students with visual impairments overall and by presence of coexisting disabilities and severity of visual impairment



NOTE: Percentages are weighted national estimates.

SOURCES: U.S. Department of Education, Institute of Education Services, National Center for Special Education Research, National Longitudinal Transition Study-2 (NLTS2), student's school program survey, 2002, and parent interview, 2001.

Figure 6. Orientation and mobility skills of students with visual impairments overall and by presence of coexisting disabilities and severity of visual impairment—Continued



NOTE: Percentages are weighted national estimates.

SOURCES: U.S. Department of Education, Institute of Education Services, National Center for Special Education Research, National Longitudinal Transition Study-2 (NLTS2), student's school program survey, 2002, and parent interview, 2001.

with students with visual impairments only, with about one-third as many students with coexisting disabilities than with visual impairments only being able to do so very well (26 percent vs. 77 percent, $p < .001$). Creating new routes to familiar places indoors is more difficult for students who are blind than for those who are partially sighted (32 percent vs.69 percent, $p < .01$).

Execute a route, given a set of verbal directions, to an unfamiliar location within one building. Slightly more than half of students with visual impairments (54 percent) are rated by school personnel to be able to follow verbal directions to find their way to an unfamiliar location within a building very well. However, fewer than one-fourth (23 percent) of students with coexisting disabilities are rated as performing this skill very well, compared with 70 percent of students without coexisting disabilities ($p < .001$). Thirty-seven percent of students who are blind are rated as being able to follow verbal directions to find an unfamiliar location indoors very well, compared with 60 percent of students who are partially sighted ($p < .05$).

Execute a route, given a set of verbal directions, to an unfamiliar location in another building. This skill poses challenges such as detecting and negotiating stairs, doors, landmarks, and other pedestrians for most students with visual impairments (Pogrund et al. 1995); fewer than half of students with visual impairments (48 percent) were rated as performing the skill very well by school staff. This skill poses greater difficulties for students with coexisting disabilities compared with their peers without them and for students who are blind compared with peers who are partially sighted. Twenty-one percent of students with coexisting disabilities are rated by school personnel as being able to negotiate a route to an unfamiliar location across a school campus with verbal directions very well, compared with 61 percent of students with visual impairments only ($p <. 001$). Students who are blind also have greater difficulty with this skill relative to students who are partially sighted (28 percent vs. 54 percent rated as doing so very well, $p < .05$).

Locate an unfamiliar place by using numbering systems. For students with visual impairments, using a numbering system to locate floors and/or rooms in an unfamiliar building (for example, room numbers begin with the floor number so that room 325 is on the third floor) poses challenges in finding unfamiliar places beyond those involved in physically negotiating the space. Overall, 46 percent of students with visual impairments are rated as performing this skill very well. As with other skills, there are significant differences in performance between students with coexisting disabilities and students without and between those who vary in the extent of impairment. Twenty-two percent of students with coexisting disabilities are rated as doing this skill very well, compared with 56 percent of students without coexisting disabilities ($p < .01$). Twenty-six percent of students who are blind are reported to do this skill very well, compared with 54 percent of students who are partially sighted ($p < .05$).

Orient self to an unfamiliar room. This skill requires a student with a visual impairment to attend to and to use auditory information (for example, echolocation, object perception, or sound shadows) to understand objects in relation to oneself; to identify the front, back, sides, and corners of a room in relation to the door; to use a specific search pattern; to locate objects in a room; and to use protective techniques

safely when traveling both with and without a cane (Pogrund et al. 1995). Although a majority of students with visual impairments (64 percent) are reported to perform this skill very well, significantly fewer students with coexisting disabilities are reported to orient to unfamiliar rooms very well than students without other disabilities (24 percent vs. 73 percent, $p < .001$). Twenty-seven percent of students who are blind are reported to orient to an unfamiliar room very well, whereas 68 percent of students who are partially sighted do so ($p < .001$).

Solicit help to orient self to a building. Requesting appropriate help and or directions to orient to a building requires a student to have a certain level of social skills, self confidence, and determination as well as the cognitive skills and a repertoire of mobility skills to use the assistance obtained (Pogrund et al. 1995). Sixty percent of students with visual impairments overall are reported to solicit help to orient to a building very well, with significant differences noted related to the presence of additional disabilities and to the severity of impairment. About one-third of students with coexisting disabilities are reported to perform this skill very well, whereas three-fourths of students with visual impairments only do so at this level (35 percent vs. 75 percent, $p < .001$). Forty-three percent of students who are blind are very able to solicit the help they need to orient to a building, compared with 69 percent of students who are partially sighted ($p < .05$).

Solicit help to orient self to a high school campus or to a workplace. In addition to the skills needed to orient to an individual building, soliciting help to orient to a school campus or workplace may require familiarity with streets, outdoor communal areas, and pedestrian traffic, for example (Pogrund et al. 1995). A similar pattern of performance is apparent for seeking help in orienting to a campus or workplace as was noted with orienting to a specific building. Sixty-one percent of students with visual impairments overall are reported to solicit help to orient to a campus or workplace very well, with about one-third of students with coexisting disabilities doing so, compared with three-fourths of students with visual impairments only (34 percent vs. 75 percent, $p < .001$) Forty-two percent of students who are blind are reported to perform this skill very well, compared with 70 percent of students who are partially sighted ($p < .05$).

Demographic Differences in the Performance of Orientation and Mobility Skills

There are no statistically significant differences in the performance of individual orientation and mobility skills among students with visual impairments who differ in gender, age, or race/ethnicity. However, soliciting help in orienting to a building and to a high school campus or workplace are reported to be significantly better for students from higher-income households. (Household incomes are categorized as: $25,000 or less, including below poverty level; $25,001 to $50,000; and more than $50,000). School personnel reported that 84 percent of students from households with incomes greater than $50,000 solicit help to orient to a building very well, compared with 47 percent and 56 percent of students from the middle and lower income groups, respectively ($p < .01$ and $p < .05$). Similarly, school personnel reported that 84 percent of students from the highest income group solicit help to orient to a high school campus or workplace very well, compared with 51 percent and 54 percent of students from the other two household income groups ($p < .05$ for both comparisons).

Summary

NLTS2 provides a national picture of the extent to which orientation and mobility services are provided to students in the category of visual impairment who receive special education services from or through public school districts or state-operated special schools during the secondary school years. Most of these students attend regular public schools (81 percent), and a minority attend special schools (19 percent). Across both settings, 54 percent receive orientation and mobility services. However, significantly fewer students with visual impairments who attend regular public schools receive orientation and mobility services than do those who attend special schools.

No statistically significant differences are noted in the receipt of orientation and mobility services for students who differ in having coexisting disabilities or in their gender, age, grade level, race/ethnicity, or household income. However, students who were blind are more likely than students who are partially sighted to receive orientation and mobility services (77 percent vs. 48 percent, respectively).

The overall percentages of students with visual impairments who are reported to perform "very well" the 10 functional mobility skills investigated in NLTS2 range across skills from 46 percent to 82 percent. On the majority of skills, students with visual impairments and no other disabilities significantly outperform students with coexisting disabilities; the differences between the two groups range from 40 to 50 percentage points. Exceptions are traveling with a sighted guide to familiar locations and traveling indoors using rotely learned routes, which do not differ significantly between the two groups. Similarly, students who are partially sighted significantly outperform their peers who are blind on all tasks except travel with a sighted guide to familiar locations (differences range from 23 to 41 percentage points).

Finally, no statistically significant differences are found in the performance of individual orientation and mobility skills for students with visual impairments who differ in demographic characteristics, with one exception. Performance in soliciting help is significantly higher for students from higher-income households (incomes more than $50,000), with 84 percent performing "very well" as compared with 47 to 56 percent for the middle and lower income groups.

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