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**Functional Limitations of
Vocational Rehabilitation (VR) Consumers
Final Report**

Functional Limitations of Vocational Rehabilitation (VR) Consumers Final Report

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Prepared by:

Beth Overman
Holly Schmidt-Davis

Research Triangle Institute
Research Triangle Park, N.C.

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Summary of Findings

In response to a request from the Rehabilitation Services Administration (RSA), the Research Triangle Institute (RTI) conducted a study to examine the feasibility of developing functional status measures for planning and implementing services to consumers in the State-Federal Vocational Rehabilitation (VR) Services Program.

To investigate this issue, RTI used the 1994–95 National Health Interview Survey-Disability Followback (NHIS-D) and data available from the ongoing Longitudinal Study of the VR Services Program to develop composite measures of functional status in three areas: 1) gross motor function; 2) personal care function; and 3) cognitive function. We then conducted analyses to address the study’s questions regarding the robustness of these measures in comparison with traditional definitions of “significance of disability” for describing VR consumers’ status and predicting outcomes of VR services.

In this summary, we have organized our findings by the eight questions that RSA developed for the study.

1. What functional limitations do VR consumers have?

- VR consumers had more functional limitations in all three areas—gross motor, cognitive and personal care functioning—than did persons with disabilities who did not receive any VR services (NHIS-D).

2. What is the relationship between functional limitations and selected consumer characteristics?

Type of disability:

Gross motor function

- Individuals with hearing impairment, learning disabilities or disabilities associated with substance abuse had particularly high gross motor functioning.

Cognitive function

- Individuals with disabilities associated with substance abuse had the highest cognitive functioning.
- Individuals with mental retardation had the lowest cognitive function.

Personal care function

- Individuals with learning disabilities, hearing impairment or disabilities associated with substance abuse had particularly high personal care functioning.

Age:

- Individuals under 26 had significantly fewer gross motor limitations than those who were over 55.
- Individuals over 55 had significantly fewer personal care limitations than those who were under 26.

Sex:

- Males had fewer limitations than females in gross motor functioning.

Education:

- Consumers with less than a high school diploma ranked significantly higher than other consumers on gross motor function and significantly lower than other consumers on cognitive function.
- Consumers with at least a high school diploma had higher cognitive function than other consumers.
- Consumers with more than a high school education ranked lower on gross motor function than other consumers.
- Consumers who did not receive special education services in high school had fewer cognitive limitations than those who did receive such services.

Employment experience:

- Individuals who were working at application to VR had fewer limitations in gross motor and personal care functioning than did applicants who were not employed.

Receipt of public assistance, including SSI/SSDI:

- Consumers who received financial assistance at application to VR had more functional limitations on all three dimensions than other consumers with significant or most significant disabilities.

Race and ethnicity:

- White consumers had significantly fewer limitations in cognitive and personal care functioning than consumers of other races.

3. *What are the interrelationships between functional limitations and the designation of individuals as: a) most significantly disabled; b) significantly disabled; c) nonsignificantly disabled; and d) Social Security recipients who “automatically” meet the first of the three criteria in the definition of “significant disability”? Are persons with these different designations of disability significance different from each other in terms of their functional limitations?*

- On all three dimensions (gross motor, cognitive and personal care functioning), persons classified as having nonsignificant disabilities were significantly higher functioning than those with either significant or most significant disabilities.
- Consumers with significant disabilities averaged higher in cognitive functioning than persons with most significant disabilities, but these two groups did not differ significantly on the other two dimensions of function.
- Consumers who received financial assistance (e.g., SSI/SSDI, public assistance) at application to VR were more limited on all three dimensions of function than other consumers with significant or most significant disabilities.

4. *What are the relationships between consumers’ functional limitations and each of the following areas?*

Vocational goals:

- Consumers whose vocational goal was structural work had the fewest gross motor limitations. Those with vocational goals in the service industry also had fewer gross motor limitations than average.
- Consumers with homemaker as their vocational goal had many more gross motor limitations than other consumers.
- The highest level of cognitive function occurred among consumers with professional, managerial or technical vocational goals. Individuals with clerical or sales goals; agricultural, fishing or forestry goals; structural work goals; or miscellaneous goals also had higher than average cognitive function.
- The lowest level of cognitive function occurred among consumers with homemaker goals. Those with machine trades, benchwork or other goals also had lower than average cognitive function.

- Consumers with structural work as their vocational goal had the highest personal care function. Those with service as their vocational goal also had higher than average personal care function.
- The lowest levels of functioning occurred among individuals with homemaker as their vocational goal.

Services received (e.g., type, duration and cost):

- Among individuals with orthopedic disabilities, those who received assistive technology assessments, devices or services ranked lower on all three functional status scales than other individuals. Those who received medical services or occupational therapy ranked lower on gross motor function.
- Among individuals with mental retardation, VR consumers who received supported employment services had higher levels of gross motor function but lower levels of cognitive function. Those who received maintenance services had higher levels of personal care function than did consumers who did not receive this service.
- Individuals with low levels of functioning in all three areas were likely to have higher average costs of purchased services and to have spent more time in VR.
- The average cost of services for individuals with low functional status in all three areas was over twice that of individuals with high functional status.
- The average number of services that individuals with low functional status in all three areas received was also significantly higher than that of individuals with high functional status.

5. *Are there differences in functional limitations for consumers whose cases were closed: a) without receiving services; b) despite the fact that they were nonrehabilitated after receiving services; c) when they were rehabilitated into noncompetitive employment; or d) when they were rehabilitated into competitive employment?*

- VR consumers who achieved competitive employment outcomes were the highest functioning of all consumers on all three functional status scales.
- Consumers who achieved a noncompetitive employment outcome, those who were eligible but did not receive services, and those who achieved noncompetitive employment outcomes having particularly low cognitive function were ranked lowest in terms of functional status.

- 6. *Are functional limitations a more consistent predictor of vocational outcome than: a) severity of disability designation; or b) other consumer characteristics, including type of disability, age, sex, education, employment experience, receipt of public assistance, and race and ethnic group?***
- When we included functional status scales in models of employment outcomes, disability significance was not a statistically important predictor of either employment outcome or competitive employment outcome. Functional status was a significant predictor of both outcomes, even after the model accounted for important consumer characteristics.
- 7. *What is the relationship between functional limitations and: a) the earnings levels of persons closed into competitive employment; b) other rehabilitants by category (e.g., homemaker, unpaid family worker); and c) stability of employment over time?***
- Among individuals who achieved competitive employment outcomes, those who earned more than \$9.00 per hour had a significantly higher cognitive function than those who earned \$5.00 or less per hour.
 - Consumers who exited into extended employment did not differ significantly from those who exited into competitive employment on gross motor and personal care function, but they ranked significantly lower on cognitive function.
- 8. *Do functional limitations change over time, especially with receipt of VR services?***
- To examine changes over time, we compared consumers' functional status at entry to VR and at exit from VR. We found no significant differences, even among consumers who exited more than three years after they entered VR.

In conclusion, because the functional status scales are based on Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) items, their utility for certain disabilities may be limited. For example, these items, while in widespread use on national surveys of individuals with disabilities, are not sensitive indicators of functional status among persons with mental illnesses or visual impairments. Therefore, as this report shows, this approach to measurement of functional status more accurately predicts outcomes; it may be appropriate to conduct further research designed to improve the utility of these measures of functional limitations for specific types of disabilities (e.g., vision impairments and mental illnesses).

Introduction

In the more than 30 years since the enactment of the *Rehabilitation Act of 1973*, Congress has consistently emphasized targeting VR services to persons whose disabilities are significant¹. This pattern culminated in the requirement of the *Rehabilitation Amendments of 1992*, which mandated that Designated State Units (DSUs) target services to the individuals whose disabilities are “most significant,” and charged each of the 83 DSUs responsible for implementing the VR service program with defining “most significant” within its jurisdiction. Three years after this statutory change, the distribution of VR consumers in terms of severity of disability reflected the new requirement, with over one-quarter of consumers classified as having a “most significant disability,” about half classified as “significantly disabled” and less than 20 percent determined to be “nonsignificantly disabled” (Hayward and Tashjian, 1996).

The fact that Congress assigned DSUs the responsibility to establish the criteria for determining a disability as “most significant” has implications for how they address one of the critical challenges in the VR system—the difficulty in assessing precisely what aspects of a sensory, physical or cognitive impairment result in specific functional limitations and how those limitations constrain an individual’s ability to obtain and retain employment.

At present, the Rehabilitation Services Administration’s (RSA) reporting system contains approximately 212 disability codes, along with specialized provisions for many of these codes (e.g., codes covering mental illness). Based on the medical model of disability, these codes require rehabilitation counselors to classify the disability according to the single code that best fits the individual’s condition. Once the counselor determines the type of disability based on medical records or assessments, he or she must then establish whether the individual has a significant disability. According to Section 7(21) of the *Rehabilitation Act of 1973*, as amended, an “individual with a significant disability” is someone:

- Who has a severe physical or mental impairment which seriously limits one or more functional capacities (such as mobility, communication, self-care, self-direction,

¹With the *1998 Amendments to the Rehabilitation Act*, the statutory language changed from “severity” to “significance” of disability. We use the current term in this report.

- interpersonal skills, work tolerance, or work skills) in terms of an employment outcome;
- Whose vocational rehabilitation can be expected to require multiple VR services over an extended period of time; and
 - Who has one or more physical or mental disabilities ... or combination of disabilities determined ... to cause comparable substantial limitation.

Most states, in defining most significant disability, have simply increased the number of functional limitations a person must have to be considered most significantly disabled. Without accurate information on the relationships between functional measures and vocational outcomes, DSUs have had little basis on which to develop more appropriate criteria for targeting services.

While the state of the art in assessment in functional status (as it relates to vocational rehabilitation) has matured in the past 10 to 15 years, the perception persists that the VR system may not be fully accessible to persons most in need of services. Although persons with significant or most significant disabilities do gain access to the VR system, constituents, advocates and Congress raise the concern that counselors may not be very effective in matching persons' functional abilities and limitations to the appropriate vocational goals, services and jobs, hence reducing the potential effectiveness of services in terms of employment and earnings outcomes.

Information available from the Longitudinal Study of the Vocational Rehabilitation Services Program permits us to examine these issues and to contribute to a better understanding of the relationships among disability classification, functional status and other factors that can be expected to affect an individual's likelihood both to seek, and to benefit from, VR services. These findings will, in turn, be helpful to RSA and Congress in deliberations regarding the reauthorization of the program, and to DSUs in their ongoing efforts to provide high-quality services leading to positive employment outcomes for persons with significant or most significant disabilities. Among the issues addressed in this report are:

- What functional limitations do VR consumers share?
- What is the relationship between functional limitations and selected consumer characteristics?

- What are the interrelationships between functional limitations and the designation of individuals as: a) most significantly disabled; b) significantly disabled; c) nonsignificantly disabled; and d) Social Security recipients who “automatically” meet the first of the three criteria in the definition of significant disability? Are persons with these different designations of disability significance different from each other in terms of their functional limitations?
- What are the relationships between consumers’ functional limitations and vocational goals and services received (including type, duration and cost of services)?
- Are there differences in functional limitations for consumers whose cases were closed: a) without receiving services; b) nonrehabilitated after receiving services; c) rehabilitated into noncompetitive employment; or d) rehabilitated into competitive employment?
- Are functional limitations a more consistent predictor of vocational outcome than: a) severity of disability designation; or b) other consumer characteristics, including type of disability, age, sex, education, employment experience, receipt of public assistance and race and ethnic group?
- What is the relationship between functional limitations and: a) the earnings levels of persons closed into competitive employment; b) other rehabilitants by category (e.g., homemaker, unpaid family worker); and c) stability of employment over time?
- Do functional limitations change over time, especially with receipt of VR services?

Study Methods

New paradigms of disability are typically distinguished among impairments, functional limitations and disabilities. Impairments refer to “anatomical, physical, or mental abnormalities or losses in one physical system” (Spector and Fleishman, 1998), while functional limitations, such as difficulty reaching, affect the performance of the whole person. Disabilities, on the other hand, are limitations in the performance of roles or tasks in the context of the social, cultural and physical environments, such as difficulty bathing. Therefore, the concept of functional disability refers to limitations in basic activities that are necessary to function in the community. These are often divided into Activities of Daily Living (ADLs), which include basic activities such as hygiene and personal care, and Instrumental Activities of Daily Living (IADLs), which include activities necessary to live in the community, such as shopping and managing money (Spector and Fleishman, 1998).

Surveys of elderly persons and of individuals with disabilities frequently include ADL and IADL items. The Survey of Income and Program Participation (SIPP), the National Health Interview Survey (NHIS) and the National Long-Term Care Survey (NLTCs) regularly collect responses to these items and provide valuable information to program planners, researchers and practitioners about individuals’ functional status. While the survey items individually are useful for estimates of overall levels of functioning on specific activities, composite measures of functional status incorporating these items both facilitate comparisons among groups and reduce the number of variables needed for statistical modeling. Furthermore, practitioners who work with individuals with disabilities may find such measures useful for decisions about how best to inform consumers of their services and to assist them in minimizing the effects of functional limitations through assistive technology or other types of accommodations. In particular, such measures would be highly relevant to programs that serve individuals with disabilities, especially those that must identify the nature and significance of individuals’ disabilities to make eligibility decisions, to develop feasible employment goals, and to plan appropriate services. The VR Services Program, whose goal is to help individuals with disabilities achieve appropriate employment outcomes, is one such program.

Section 7(20) of the *Rehabilitation Act* defines an individual with a disability as “any individual who has a physical or mental impairment which for such individual constitutes or

results in a substantial impediment to employment; and can benefit in terms of an employment outcome from vocational rehabilitation services.” As stated earlier, an individual with a significant disability is defined by Section 7(21) of the *Rehabilitation Act* as an individual with a disability who, among other things, has a severe physical or mental impairment that seriously limits one or more functional capacities in terms of an employment outcome and whose vocational rehabilitation can be expected to require multiple services over an extended period of time. Finally, an individual with a most significant disability is defined as “an individual with a significant disability who meets criteria established by the State” (Section 7(21) of the *Rehabilitation Act Amendments*).

Traditionally, the VR system has relied on medical documentation and counselors’ assessments of the significance or severity of individuals’ disabilities to determine their eligibility for VR services. Although counselors use the federally mandated definition to determine if a disability is significant, each state determines its own criteria for deciding if a disability is most significant. In determining whether a disability is most significant, most DSUs have expanded the federal definition of significant by increasing the number of limitations from “one or more” to “three or more.” These determinations lack the precision and sensitivity that the system needs to serve consumers as effectively as possible.

We used two data sources for the analyses in this report: the 1994–95 National Health Interview Survey-Disability Supplement (NHIS-D), and the Longitudinal Study of the Vocational Rehabilitation Services Program. Both surveys contain ADL and IADL items. NHIS-D contains two parts, one of which was administered along with the core survey to a sample designed to represent the civilian noninstitutionalized population of the United States. The second part, the Disability Followback Survey, was administered later only to those individuals whose responses indicated that they met the NHIS definition of “disability.” The Longitudinal Study of the VR Services Program is a national impact evaluation that investigates the effects of VR services on economic and other outcomes for individuals with disabilities who receive such services. The Longitudinal Study drew a nationally representative sample of more than 8,000 respondents, including applicants for VR services (some of whom were not accepted for services), VR consumers, and former VR consumers.

Based on statistical techniques and a review of the functional status literature, we developed three functional status scales using ADL and IADL items from these surveys. The first scale, gross motor function, includes items such as “walking for a quarter of a mile” and “walking up a flight of stairs.” The cognitive function scale includes “managing your money” and “shopping for personal items,” and the personal care scale includes “bathing or showering” and “dressing.” Values on each scale range from one to two, with a high score indicating a higher level of functioning.

Study Findings

In this section we organize study findings around the questions that formed the basis for the study.

What functional limitations do VR consumers have?

Using data from NHIS-D, we compared the average functional status scores of three groups of respondents with disabilities. The first group reported having received VR services through a VR agency; the second group received similar services through other means; and the third group did not report receiving any VR services. As table 1 indicates, individuals who received services through a VR agency had more limitations on all three scales than those who did not receive any services. They also had more cognitive function limitations than those who received services through other means.

Table 1. Functional status by service group

Service group	Gross motor function ^b	Cognitive function ^{a,b}	Personal care function ^b
Received VR services through VR agency	1.61	1.86	1.86
Received VR services through other means	1.61	1.90	1.87
Non-service disabled population ^c	1.76	1.95	1.94

Source: National Health Interview Survey — Disability Supplement

High values indicate fewer functional limitations.

^a Indicates a statistically significant difference ($p < .05$) between individuals who received services through a VR agency and individuals who received services through other means.

^b Indicates a statistically significant difference ($p < .05$) between individuals who received services through a VR agency and members of the non-service disabled population.

^c Did not receive any VR services.

What is the relationship between functional limitations and selected consumer characteristics such as: a) type of disability; b) age; c) sex; d) education; e) employment experience; f) receipt of public assistance, including SSI/SSDI; and g) race and ethnicity?

Using the NHIS-D scales, we compared individuals with different types of disabilities (table 2). Individuals with vision impairments had significantly fewer limitations in the areas of gross motor function and personal care function, while those with hearing impairments had significantly fewer limitations on all three scales. On average, individuals with both orthopedic

and nonorthopedic physical disabilities had significantly more limitations on gross motor function and personal care function. Those with orthopedic disabilities had fewer cognitive limitations. The number of limitations for individuals with mental illnesses, learning disabilities or disabilities associated with substance abuse was lower than average on all three scales. Individuals with mental retardation had more than the average number of limitations in cognitive function, and fewer than average gross motor limitations.

Table 2. Functional status by disability type (NHIS-D)

Disability type	Gross motor function	Cognitive function	Personal care function
Vision impairment	1.80 ^b	*	1.96 ^b
Hearing impairment	1.91 ^b	1.97 ^b	1.99 ^b
Orthopedic, including amputation	1.53 ^a	1.90 ^b	1.85 ^a
Nonorthopedic physical	1.55 ^a	1.88	1.88 ^a
Mental illness	1.80 ^b	1.92 ^b	1.96 ^b
Mental retardation	1.82 ^b	1.58 ^a	1.91
Substance abuse	1.92 ^b	1.98 ^b	1.98 ^b
Learning disability	1.93 ^b	1.92 ^b	2.00 ^b
All disabled persons	1.62	1.89	1.89

Source: National Health Interview Survey — Disability Supplement

High values indicate fewer functional limitations.

^a Individuals with this type of disability function significantly ($p < .05$) lower on this dimension than individuals with all other disabilities.

^b Individuals with this type of disability function significantly ($p < .05$) higher on this dimension than individuals with all other disabilities.

* As noted in Appendix A, individuals with vision impairments are excluded from the cognitive function scale.

Similarly, table 3 presents a comparison of functional status across disability type for participants in the Longitudinal Study. Consumers with hearing impairments ranked significantly higher than others on all three dimensions. Individuals with orthopedic and nonorthopedic physical disabilities ranked higher than other consumers on cognitive function; however, while those with orthopedic disabilities ranked lower than other consumers on gross motor function, there was no significant difference between consumers with nonorthopedic physical disabilities and other consumers on this dimension. Furthermore, while consumers with orthopedic disabilities ranked lower than average on personal care functioning, those with nonorthopedic disabilities ranked higher than average. Individuals with mental illnesses and disabilities associated with substance abuse ranked higher on all three functional status measures than those with other disabilities. Individuals

with mental retardation ranked higher than average on gross motor function and lower than average on cognitive function. Consumers with learning disabilities ranked significantly higher than other consumers on both gross motor function and personal care function.

Table 3. Functional status by disability type (Longitudinal Study)

Disability type	Gross motor function	Cognitive function	Personal care function
Vision impairment	1.74	N/A*	1.96
Hearing impairment	1.93 ^b	1.92 ^b	1.99 ^b
Orthopedic, including amputation	1.64 ^a	1.89 ^b	1.93 ^a
Nonorthopedic physical	1.80	1.92 ^b	1.99 ^b
Mental illness	1.91 ^b	1.90 ^b	1.99 ^b
Mental retardation	1.92 ^b	1.56 ^a	1.98
Substance abuse	1.93 ^b	1.94 ^b	2.00 ^b
Learning disability	1.96 ^b	1.85	2.00 ^b
Traumatic brain injury	1.84	1.81	1.94
All other conditions	1.92 ^b	1.82	1.98
All consumers	1.82	1.85	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Individuals with this type of disability function significantly ($p < .05$) lower on this dimension than individuals with all other disabilities.

^b Individuals with this type of disability function significantly ($p < .05$) higher on this dimension than individuals with all other disabilities.

* As noted in Appendix A, individuals with vision impairments are excluded from the cognitive function scale.

These two sets of analyses reveal common trends in levels of functioning across disability type. Individuals with hearing impairments, learning disabilities and disabilities associated with substance abuse had particularly high gross motor function in both data sets, while individuals with orthopedic disabilities had very low gross motor function in both data sets. However, while individuals with nonorthopedic disabilities in the Longitudinal Study were closer in rank to the overall average on gross motor function, individuals with this same type of disability in NHIS-D ranked much lower on this dimension. In both data sets, individuals with disabilities associated with substance abuse had the highest cognitive function, while individuals with mental retardation had the lowest. Individuals in both data sets with learning disabilities, hearing impairments and disabilities associated with substance abuse had particularly high personal care function, while those with orthopedic disabilities had particularly low personal care function. Individuals with

nonorthopedic disabilities in the Longitudinal Study had lower than average personal care function, while those in NHIS-D had higher than average personal care function. These differences may be due to differences in the questions that make up the scales or to differences in the populations studied in the two data sets. (For more information, see Overman and Schmidt-Davis, 2000.)

We also compared the functional status of participants in the Longitudinal Study by age group, race and ethnicity and gender (table 4). We compared the youngest consumers (under 26) with the oldest (over 55); overall, individuals under 26 had significantly fewer gross motor limitations than those who were over 55, while individuals over 55 had significantly fewer personal care limitations than those who were under 26. White consumers had significantly fewer limitations in cognitive functioning than consumers of any other race. There were no significant differences between consumers of Hispanic origin and other consumers. On average, males had fewer limitations on the gross motor functioning scale than females.

Table 4. Functional status by demographic characteristics

Characteristic	Gross motor function^{a,c}	Cognitive function^b	Personal care function^{a,b}
<i>Age</i>			
Less than 26	1.93	1.82	1.98
26 to 35	1.85	1.86	1.97
36 to 45	1.79	1.87	1.97
46 to 55	1.75	1.87	1.96
Over 55	1.70	1.81	1.96
<i>Race and ethnicity</i>			
White	1.82	1.86	1.97
Other races	1.80	1.80	1.97
Of Hispanic Origin	1.81	1.85	1.97
<i>Gender</i>			
Male	1.84	1.85	1.97
Female	1.79	1.86	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference (p<.05) between those under 26 years and those over 55 years.

^b Indicates a significant difference (p<.05) between white consumers and consumers of other races.

^c Indicates a significant difference (p<.05) between males and females.

Table 5 compares functional status across educational level. Consumers without a high school diploma were significantly higher than other consumers on gross motor function and significantly lower than other consumers on cognitive function. Those with high school diplomas or higher levels of education had higher cognitive function than other consumers. Individuals with more than a high school education ranked lower on gross motor function than other consumers.

Table 5. Functional status by education attainment

Education level	Gross motor function	Cognitive function	Personal care function
Less than high school	1.84 ^a	1.81 ^a	1.98
High school diploma/GED	1.82	1.89 ^a	1.97
More than high school	1.80 ^a	1.89 ^a	1.97
All consumers	1.82	1.87	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference (p<.05) between those at this educational level and other consumers.

In a separate report (Hayward and Schmidt-Davis, 1999), we analyzed the functional status of VR consumers between the ages of 18 and 25 by receipt of special education services. As table 6 shows, while they did not differ significantly in terms of gross motor and personal care function, individuals who did not receive special education services in high school had fewer cognitive limitations.

Table 6. Functional status of transitional youths (youths with disabilities between the ages of 18 and 25) by receipt of special education services

Functional limitation	Received special education services in high school		
	Yes	No	Total
Gross motor function	1.94	1.93	1.93
Cognitive function ^a	1.73	1.94	1.82
Personal care function	1.98	1.99	1.98

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference (p<.05) between those who received special education services in high school and those who did not.

As table 7 shows, individuals who were working at application to VR had fewer limitations on the gross motor scale and on the personal care scale.

Table 7. Functional status by work status at application to VR

Work status at application to VR	Gross motor function^a	Cognitive function	Personal care function^a
Working	1.88	1.89	1.98
Not working	1.81	1.89	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between those working at application to VR and those not working at application to VR.

As table 8 indicates, individuals who received SSI or SSDI at entry to VR ranked much lower on all three functional status scales.

Table 8. Functional status by receipt of SSI/SSDI

Received SSI/SSDI	Gross motor function^a	Cognitive function^a	Personal care function^a
Yes	1.79	1.78	1.96
No	1.84	1.90	1.98

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between those who received SSI/SSDI and those who did not.

What are the interrelationships between functional limitations and the designation of individuals as: a) most significantly disabled; b) significantly disabled; c) nonsignificantly disabled; and d) Social Security recipients who are presumed to be individuals with a significant disability? Are persons with these different designations of disability significance different from each other in terms of their functional limitations?

As table 9 indicates, all three functional status scales differentiate between: 1) consumers with significant disabilities and those with nonsignificant disabilities; and 2) between consumers with most significant disabilities and those with nonsignificant disabilities. Only the cognitive functioning scale distinguishes between those with significant disabilities and those with most significant disabilities. On all three dimensions, those with nonsignificant disabilities ranked significantly higher than those with significant disabilities and those with most significant disabilities. Consumers with significant disabilities ranked higher on the cognitive functioning

scale than those with most significant disabilities, but these two groups did not differ significantly on the other two scales.

Table 9. Functional status by significance of disability

Significance of disability	Gross motor function ^{ab}	Cognitive function ^{abc}	Personal care function ^{ab}
Not significant	1.86	1.92	1.99
Significant	1.81	1.86	1.97
Most significant	1.81	1.80	1.96

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between those with nonsignificant disabilities and those with most significant disabilities.

^b Indicates a significant difference ($p < .05$) between those with nonsignificant disabilities and those with significant disabilities.

^c Indicates a significant difference ($p < .05$) between those with most significant disabilities and those with significant disabilities.

Table 10 presents a comparison between the functional status of individuals who received SSI or SSDI at entry to VR and of other individuals with significant or most significant disabilities. Overall, consumers who received financial assistance had more functional limitations on all three dimensions.

Table 10. Functional status by automatic significance designation

Recipient	Gross motor function ^a	Cognitive function ^a	Personal care function ^a
SSI/SSDI recipient	1.79	1.78	1.96
Other significantly or most significantly disabled	1.83	1.89	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between SSI/SSDI recipients and other individuals with significant/most significant designations.

What are the relationships between consumers' functional limitations and: a) vocational goals; and b) services received (type, duration and cost)?

As table 11 indicates, consumers whose vocational goal is structural work had the fewest gross motor limitations. Those with vocational goals in the service industry also had fewer gross motor limitations than average. Consumers with homemaker as their vocational goal had many more gross motor limitations than other consumers.

Table 11. Functional status by vocational goal

Vocational goal	Gross motor function	Cognitive function	Personal care function
Professional/managerial/technical	1.83	1.92 ^a	1.97
Clerical/sales	1.79	1.88 ^a	1.97
Service	1.87 ^a	1.80	1.98 ^a
Agriculture/fishing/forestry	1.87	1.87 ^a	1.98
Processing	1.76	1.76	1.93
Machine trades	1.83	1.85 ^a	1.97
Benchwork	1.83	1.71 ^a	1.97
Structural work	1.91 ^a	1.88 ^a	1.99 ^a
Homemaker	1.49 ^a	1.29 ^a	1.92 ^a
Miscellaneous	1.85	1.89 ^a	1.97
Other	1.79	1.85 ^a	1.96
All consumers	1.83	1.86	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between those with this vocational goal and those with all other vocational goals.

The highest level of cognitive function occurred among consumers with professional, managerial or technical vocational goals. Individuals with clerical or sales goals; agricultural, fishing, or forestry goals; structural work goals; and miscellaneous goals also had higher than average cognitive function. The lowest level of cognitive function occurred among consumers with homemaker goals. Those with machine trades, benchwork and other goals also had lower than average cognitive function.

Consumers with structural work as their vocational goal had the highest personal care function. Those with service as their vocational goal also had higher than average personal care function. Again, the lowest levels of functioning occurred among individuals with homemaker as their vocational goal.

To investigate the relationship between consumers' functional status and the services they receive, we focused on two groups of consumers: those with orthopedic disabilities and those with mental retardation. We selected these two groups because they represent a large subset of the VR population (28.9 percent of Longitudinal Study participants had orthopedic

disabilities; 8.4 percent had mental retardation) and because of the differences in their functioning levels. As discussed earlier, individuals with orthopedic disabilities had higher than average cognitive function but lower than average gross motor function, while the reverse was true for individuals with mental retardation. For each group, we selected services that are relevant to consumers' functional status and compared individuals who received that service with those who did not. Next, we examined: 1) the relationship between functional status measures and the number of months an individual received VR services; 2) the relationship between these measures; and 3) the cost of VR services by calculating correlation coefficients for each group.

Among individuals with orthopedic disabilities, those who received assistive technology assessments, devices or services ranked lower on all three functional status scales than other individuals (tables 12, 13 and 14). Those who received medical services or occupational therapy ranked lower on gross motor function.

Among individuals with mental retardation, those who received supported employment services had higher levels of gross motor function (table 15), but lower levels of cognitive function (table 16). Those who received maintenance services had higher levels of personal care function than those who did not (table 17).

While a correlational analysis of all consumers revealed no significant correlations between: 1) functional status measures individually and throughout their time in VR; 2) the cost of VR services; or 3) the number of services, there was a small but significant relationship between an overall measure of functional status² and their time in VR, the cost of VR services and the number of services received. In all three cases, the correlation was negative (-.06 for cost of services; -.03 for time in VR; and -.05 for number of services), indicating that individuals with low levels of functioning were likely to have higher costs and more time in VR. Furthermore, the average cost of services for individuals with low functional status was over twice that of individuals with high functional status, and the average number of services for

²To create an overall measure of functional status, we standardized values on the three functional status scales (to put them on the same metric) and then averaged the three values. Because we did not assign values on the cognitive function scale for individuals with vision impairments (see Appendix A), they are not included in this analysis.

individuals with low functional status was also significantly higher than that of individuals with high functional status (table 18).

Table 12. Gross motor function by receipt of selected services (individuals with orthopedic disabilities)

Service	Received service	Did not receive service
Assistive technology assessment ^a	1.34	1.66
Assistive technology devices ^a	1.47	1.68
Assistive technology services ^a	1.37	1.65
Medical services ^a	1.61	1.65
Physical therapy	1.60	1.65
Occupational therapy ^a	1.42	1.65
In-house vocational evaluation	1.69	1.64
Off-site vocational evaluation	1.66	1.64

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between individuals who received the service and those who did not.

Table 13. Cognitive function by receipt of selected services (individuals with orthopedic disabilities)

Service	Received service	Did not receive service
Assistive technology assessment ^a	1.71	1.90
Assistive technology devices ^a	1.81	1.90
Assistive technology services ^a	1.72	1.89
Medical services	1.88	1.89
Physical therapy	1.88	1.89
Occupational therapy	1.79	1.89
In-house vocational evaluation	1.90	1.89
Off-site vocational evaluation	1.88	1.89

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between individuals who received the service and those who did not.

Table 14. Personal care function by receipt of selected services (individuals with orthopedic disabilities)

Service	Received service	Did not receive service
Assistive technology assessment ^a	1.73	1.94
Assistive technology devices ^a	1.84	1.94
Assistive technology services ^a	1.70	1.93
Medical services	1.93	1.93
Physical therapy	1.92	1.93
Occupational therapy	1.83	1.93
In-house vocational evaluation	1.93	1.93
Off-site vocational evaluation	1.93	1.93

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between individuals who received the service and those who did not.

Table 15. Gross motor function by receipt of selected services (individuals with mental retardation)

Service	Received service	Did not receive service
Work adjustment	1.92	1.92
Supported employment ^a	1.95	1.91
Maintenance	1.93	1.92
Transportation	1.92	1.92
In-house vocational evaluation	1.92	1.92
Off-site vocational evaluation ^a	1.90	1.92

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between individuals who received the service and those who did not.

Table 16. Cognitive function by receipt of selected services (individuals with mental retardation)

Service	Received service	Did not receive service
Work adjustment	1.51	1.58
Supported employment ^a	1.48	1.59
Maintenance	1.59	1.56
Transportation	1.55	1.57
In-house vocational evaluation ^a	1.62	1.56
Off-site vocational evaluation	1.51	1.59

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between individuals who received the service and those who did not.

Table 17. Personal care function by receipt of selected services (individuals with mental retardation)

Service	Received service	Did not receive service
Work adjustment	1.99	1.98
Supported employment	1.99	1.98
Maintenance ^a	2.00	1.98
Transportation	1.98	1.98
In-house vocational evaluation	2.00	1.98
Off-site vocational evaluation	1.96	1.99

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between individuals who received the service and those who did not.

Table 18. Overall functional status by average cost of services

Overall functional status	Average cost of services	Average number of services
High	\$4,667	8.8
Middle	\$5,796	9.0
Low	\$11,213	10.1

Source: VR Longitudinal Study

Are there differences in functional limitations for consumers whose cases were closed: a) without receiving services; b) nonrehabilitated after receiving services; c) rehabilitated into noncompetitive employment; and d) rehabilitated into competitive employment?

As table 19 shows, the highest functioning levels on all three functional status scales were for consumers who achieved competitive employment outcomes. Individuals who were ineligible for services had the second highest level on all three scales (although their personal care function did not differ significantly from consumers who achieved a competitive employment outcome), followed by those who received services but failed to achieve an employment outcome. Consumers who achieved a noncompetitive employment outcome and those who were eligible but did not receive services were the lowest-scoring groups, with those who achieved noncompetitive employment outcomes having particularly low cognitive function.

Table 19. Functional status by closure status

	Gross motor function	Cognitive function	Personal care function
Achieved a competitive employment outcome	1.87	1.89	1.98
Achieved a noncompetitive employment outcome	1.79 ^a	1.67 ^a	1.96 ^a
Received services, but failed to achieve an employment outcome	1.80 ^a	1.85 ^a	1.97 ^a
Eligible, but did not receive services	1.77 ^a	1.85 ^a	1.96 ^a
Ineligible for services	1.80 ^a	1.86 ^a	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference (p<.05) between those in this category and those who achieved a competitive employment outcome.

Are functional limitations a more consistent predictor of vocational outcome than: a) severity of disability designation; or b) other consumer characteristics, including type of disability, age, sex, education, employment experience, receipt of public assistance and race and ethnic group?

We conducted two regression analyses to investigate the effect of functional status on employment outcomes. In both analyses, we included the following variables: disability type, age, sex, years of education, work status at application, receipt of SSI or SSDI, race (white or nonwhite), and the three functional status scales. Table 20 shows which of these factors significantly predict whether consumers achieved an employment outcome at closure and if they did, whether this outcome was competitive. Figures 1 and 2 present these results graphically.

Individuals with visual or hearing impairments and those with mental retardation were more likely than individuals with orthopedic disabilities to achieve an employment outcome at closure, while consumers with mental illnesses were less likely than those with orthopedic disabilities. Working at application of VR services increased the odds of achieving an employment outcome, while receiving SSI or SSDI and being nonwhite decreased the odds. Higher levels of gross motor function were associated with achieving an employment outcome.

Having either a visual impairment, mental illness or mental retardation decreased the likelihood of achieving a competitive employment outcome. Older individuals and those who received SSI or SSDI were also less likely to achieve a competitive employment outcome. Higher levels of gross motor function and cognitive function were associated with achieving a competitive employment outcome.

Table 20. Regression models of consumer outcomes*

Model	Influencing factor	Unstandardized weight	p
<i>Employment Outcome (R² = .06)</i>			
	Vision (versus orthopedic physical)	0.80	.0013
	Hearing (versus orthopedic physical)	0.62	.0003
	Mental illness (versus orthopedic physical)	-0.21	.0392
	Mental retardation (versus orthopedic physical)	0.62	<.0001
	Working at application for VR services	0.79	<.0001
	Receipt of SSI/SSDI	-0.41	<.0001
	Nonwhite	-0.26	.0029
	High gross motor function	0.77	<.0001
<i>Competitive Employment Outcome (R² = .17)</i>			
	Vision (versus orthopedic physical)	-0.71	.0229
	Mental illness (versus orthopedic physical)	-0.79	<.0001
	Mental retardation (versus orthopedic physical)	-1.36	<.0001
	Age (older)	-0.03	<.0001
	Receipt of SSI/SSDI	-0.63	<.0001
	High gross motor function	1.00	.0004
	High cognitive function	2.08	<.0001

Source: VR Longitudinal Study

* We used unweighted stepwise logistic regression techniques to create these two models.

After including the functional limitation scales in the analysis, we found that in these two models, disability significance was not a statistically important predictor of either employment outcome or competitive employment outcome. While information about individuals' functional limitations contributed to our understanding of employment outcomes, information about the significance of their disabilities was decidedly less useful in this regard.

In a related analysis, we tested the combined effect of all three functional status measures on these two outcomes after including all of the aforementioned factors. The effect of functional status was significant for both outcomes, indicating that functional status had a relationship with employment outcomes even after other important characteristics were considered.

Figure 1. Employment outcome ($R^2 = .06$)

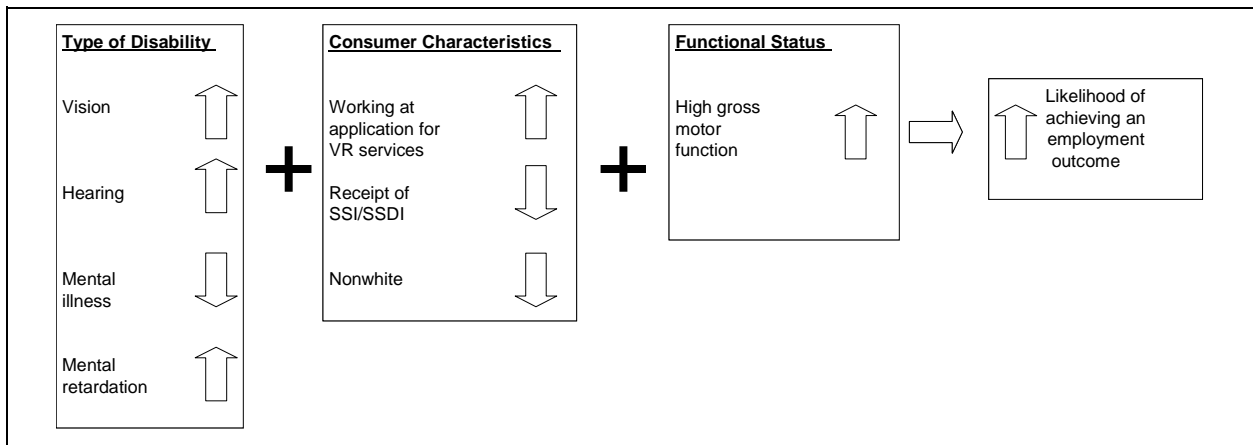
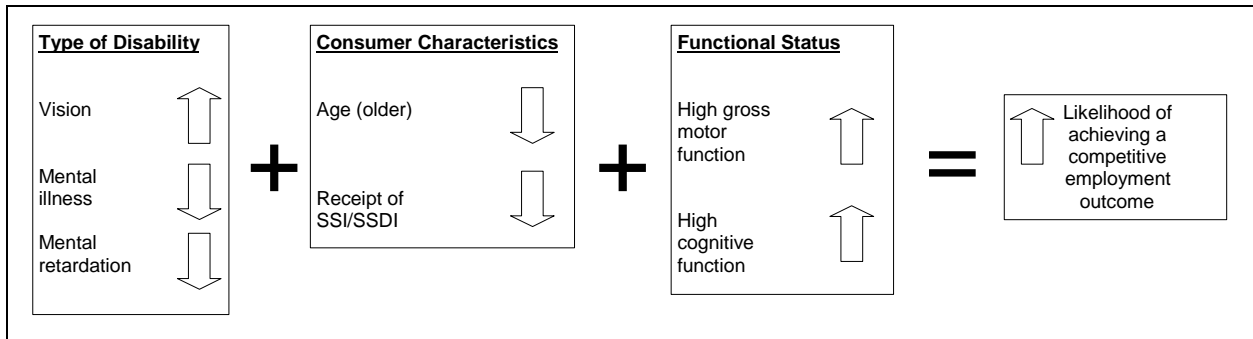


Figure 2. Competitive employment outcome ($R^2 = .17$)



What is the relationship between functional limitations and: a) the earnings levels of persons closed into competitive employment; b) other rehabilitants by category (e.g., homemaker, unpaid family worker); and c) stability of employment over time?

Among individuals who achieved a competitive employment outcome, those who earned more than \$9.00 per hour had significantly higher cognitive function than those who earned up to \$5.00 per hour. There were no significant differences on the other two functional status scales (table 21).

Tashjian and Schmidt-Davis (2000) looked at the functional status of consumers who exited VR into supported employment (SE) and compared them with other consumers who achieved an employment outcome at exit (table 22). To separate the effect of disability type from the effect of type of employment at exit, we compared individuals with mental retardation who achieved a supported employment outcome with other individuals who achieved a supported employment outcome. We discovered that consumers with mental retardation had more cognitive limitations than other SE consumers. Next, we compared consumers with mental retardation who achieved an employment outcome other than by supported employment with consumers with other types of disabilities who achieved a nonsupported employment outcome. The data showed that consumers with mental retardation in this group had fewer gross motor limitations and more cognitive limitations than other consumers in this group.

Table 21. Functional status by earnings levels

	Gross motor function	Cognitive function^a	Personal care function
Less than or equal to \$5.00 per hour	1.88	1.83	1.98
\$5.01 - \$7.00 per hour	1.86	1.89	1.99
\$7.01 - \$9.00 per hour	1.86	1.93	1.98
More than \$9.00 per hour	1.87	1.93	1.98

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference in means or percentages between those earning less than or equal to \$5.00 per hour and those earning more than \$9.00 per hour ($p < .05$).

Table 22. Functional status by supported employment and disability type

Function	Supported employment consumers			Other consumers		
	SE consumers with mental retardation	Other SE consumers	Total SE consumers	Consumers with mental retardation	Other consumers	Total consumers
Gross motor function ^b	1.87	1.82	1.83	1.93	1.82	1.83
Cognitive function ^{a,b}	1.59	1.83	1.82	1.54	1.85	1.82
Personal care function	1.97	1.98	1.98	1.98	1.97	1.97

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference between SE consumers with mental retardation and other SE consumers.

^b Indicates a significant difference between consumers with mental retardation and other consumers.

We also compared consumers who achieved an employment outcome by the type of job they had at exit from VR. Table 23 shows that, while consumers who exited into sheltered workshops did not differ significantly from those who exited into competitive employment on gross motor and personal care function, they ranked significantly lower on cognitive function.

Table 23. Functional status by sheltered workshop versus competitive employment

Function	Consumers closed into sheltered workshops	Consumers closed into competitive employment
Gross motor function	1.81	1.86
Cognitive function ^a	1.67	1.91
Personal care function	1.95	1.98

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference between consumers closed into sheltered workshops and consumers closed into competitive employment.

Table 24 presents a comparison of functional status of consumers who were employed at closure only with those who were employed up to three years later. This analysis revealed no significant differences on any of the three scales.

Table 24. Functional status by retention of employment over time (competitively employed only)

Length of time employed	Gross motor function^a	Cognitive function	Personal care function
Employed at exit from VR, not employed in subsequent years	1.85	1.89	1.98
Employed at 1-year follow-up, not employed in subsequent years	1.86	1.90	1.99
Employed at 2-year follow-up, not employed in subsequent years	1.88	1.89	1.99
Employed at 3-year follow-up, not employed in subsequent years	1.89	1.89	1.98

Source: VR Longitudinal Study

High values indicate fewer functional limitations.

^a Indicates a significant difference ($p < .05$) between those employed at closure and up to their one year follow-up and those who were employed at the time of their two- or three-year follow-up.

Do functional limitations change over time, especially with receipt of VR services?

To examine changes over time, we compared consumers' functional status scores at entry to VR and at exit from VR. We found no significant differences, even among consumers who closed more than three years after they entered VR.

Conclusion

Functional status scales provide more comprehensive information about the nature of consumers' impairments and about how these impairments constrain their abilities to obtain and retain employment than the traditional classification of disabilities as nonsignificant, significant or most significant. These scales offer efficient ways of capturing differences between groups. As our analyses have shown, VR consumers differ on these three dimensions across disability, demographic, vocational characteristics, type of services received and employment outcomes. Furthermore, functional status scales are much more powerful predictors of employment outcomes and of competitive employment outcomes than the significance designation set forth in the *Rehabilitation Act*. We plan to use these scales in more complex structural equation and path analysis models that will provide better information about the effect of initial functional status over time and the effect of receipt of services on functional status.

In conclusion, because the functional status scales are based on Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) items, their utility for certain disabilities may be limited. These items, while in widespread use on national surveys of individuals with disabilities, are not sensitive indicators of functional status among persons with mental illness or visual impairments, for example. Therefore, since this approach to the measurement of functional status has promise, it may be appropriate to conduct further research designed to improve the utility of these measures for specific types of disabilities.

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Appendix A:

Theoretical Background and Scale Development

Theoretical Background

Gerontology researchers have used factor analysis to explore the number of underlying dimensions in ADL and IADL items with differing results (table A-1). Johnson and Wolinsky (1993) identified five factors—Basic ADL, Household ADL, Advanced ADL, and Lower and Upper Body Limitations³—that seemed to summarize the functional status of individuals aged 70 or older. In a study of hospital patients aged 45 or older, Fitzgerald et al. also identified the Basic, Advanced and Household ADL dimensions in addition to a fourth dimension, incontinence. Clark, Stump and Wolinsky (1997) found further evidence for these first three factors. Using data from the National Long-Term Care Survey, they identified three factors: Self-care (similar to Basic ADL), Home-care (similar to Household ADL), and Cognitive function (similar to Advanced ADL).

However, using the same data source but different analysis techniques, Spector and Fleishman (1998) concluded that only one dimension underlies these items. Thomas, Rockwood and McDowell (1998) found three factors that they labeled basic self-care, intermediate self-care and complex self-management. These factors do not correspond very closely to the factors that earlier researchers identified.

Overall, Wolinsky and his colleagues seem to have found a stable set of three factors within the ADL and IADL items. Differences between their results and the results of Spector and Fleishman and Thomas and his colleagues are attributable to: different populations; different analysis techniques (principal components analysis versus principal axis factor analysis; tetrachoric correlations versus Pearson correlations); slightly different sets of items (i.e., Spector and Fleishman used “going outside of walking distance” while other researchers did not); and different assumptions about the structure of these items (for example, Clark et al. attempted to confirm Johnson and Wolinsky’s model rather than to conduct an exploratory analysis).

None of this research, however, has examined the dimensionality of functional status in the nonelderly population. Thus, it is unclear if the factor structure underlying older adults’

³In this study, Johnson and Wolinsky used items from Nagi’s disability scale. These items make up the Lower and Upper Body Limitations Scales and do not appear in the other models we discuss.

responses to these items is similar to that of younger individuals. To address this issue, we used data from the 1994–95 National Health Interview Survey-Disability Supplement (NHIS-D) and the Longitudinal Study of the Vocational Rehabilitation Services Program.⁴ Both of these surveys include ADL and IADL items. NHIS-D contains two parts, one of which was administered along with the core survey to a sample designed to represent the civilian noninstitutionalized population of the United States. The second part, the Disability Followback Survey, was administered later only to those individuals whose responses indicated that they met the NHIS definition of disability. The National Center for Health Statistics used a variety of questions from the Core Questionnaire and the Disability Supplement to select respondents for the Disability Followback Survey, including questions about limitations in major life activities, use of assistive devices, selected physical or mental health conditions, receipt of or application for public assistance, participation in employment services or other programs, difficulty in social functioning, and ADL and IADL questions. The ADL and IADL items used in our analysis appear on the Disability Followback Survey.

The Longitudinal Study of the VR Services Program is a national impact evaluation that investigates the effects of VR services on economic and other outcomes for individuals with disabilities who receive such services. The Longitudinal Study drew a nationally representative sample of more than 8,000 respondents, including applicants for VR services (some of whom were not accepted for services), VR consumers, and former VR consumers. The data used in our analysis come from an interview conducted with applicants and VR consumers at entry into the study.

⁴ Under contract to the Rehabilitation Services Administration, U.S. Department of Education, the Research Triangle Institute is conducting this congressionally mandated impact evaluation of the State-Federal VR Services Program. The study is scheduled for completion in 2002.

Table A-1. Review of functional status literature

Source	Population	Data source	Factors
<p>Johnson, Robert J., and Wolinsky, Fredric D. (1993). "The Structure of Health Status Among Older Adults: Disease, Disability, Functional Limitation, and Perceived Health." <i>Journal of Health and Social Behavior</i>, 34(2): 105-121.</p>	<p>5,151 individuals aged 70 or older</p>	<p>1984 Longitudinal Study on Aging (a supplement to the 1984 Health Interview Survey)</p>	<p>Basic ADL (Bathing, dressing, getting out of bed, walking, toileting)</p> <p>Household ADL (Meal preparation, shopping, light housework, heavy housework)</p> <p>Advanced ADL (Managing money, using the telephone, eating)</p> <p>Lower body limitations (Walking a quarter of a mile; walking up 10 steps without rest; standing or being on your feet for two hours; stooping, crouching or kneeling; and lifting or carrying 25 pounds)</p> <p>Upper body limitations (Sitting for two hours; reaching up over your head; reaching out as if to shake hands; and using fingers to grasp objects)</p>

Table A-1. (continued)

Source	Population	Data source	Factors
Fitzgerald, John F., Smith, David M., Martin, Douglas K., Freedman, Jay A., and Wolinsky, Fredric D. (1993). "Replication of the Multidimensionality of Activities of Daily Living." <i>Journal of Gerontology</i> , 48(1): S28-S31.	668 hospital patients aged 45 years or older	A randomized controlled trial of an intervention using case managers to reduce hospital utilization at a Veterans Administration medical center in Indianapolis, Ind.	<p>Advanced ADL (Using the telephone, managing money, eating, and taking medications)</p> <p>Basic ADL (Dressing, transferring, walking, and bathing)</p> <p>Household ADL (Preparing meals, shopping, performing housework, and traveling to places out of walking distance)</p> <p>Incontinence</p>
Clark, Daniel O., Stump, Timothy W., and Wolinsky, Fredric D. (1997). "A Race- and Gender- Specific Replication of Five Dimensions of Functional Limitation and Disability." <i>Journal of Aging and Health</i> , 9(1): 28-42.	14,415 community-dwelling individuals aged 65 or older who identified themselves as Black or White (for some analyses, the authors used data from 4,297 of these individuals who reported an ADL- or IADL-based disability)	1989 National Long-Term Care Survey	<p>Self-care (Getting in/out of bed, getting around inside, bathing, toileting)</p> <p>Home-care (Light housework, laundry, grocery shopping, meal preparation)</p> <p>Cognitive (Managing money, using telephone, taking medication)</p>

Table A-1. (continued)

Source	Population	Data source	Factors
<p>Spector, William D. and Fleishman, John A. (1998). "Combining Activities of Daily Living With Instrumental Activities of Daily Living to Measure Functional Disability." <i>Journal of Gerontology</i>, 53B (1): S46-S57.</p>	<p>2,977 individuals aged 65 or older with functional disabilities in at least one of 16 ADLs or IADLs</p>	<p>1989 National Long-Term Care Survey</p>	<p>One overall factor (Going outside of walking distance; shopping; doing laundry; bathing; getting around outside; preparing meals; taking medications; managing money; getting around inside; light housework; dressing; transferring; toileting; using the telephone; help with incontinence; feeding)</p>
<p>Thomas, Vince S., Rockwood, Kenneth, and McDowell, Ian (1998). "Multidimensionality in Instrumental and Basic Activities of Daily Living." <i>Journal of Clinical Epidemiology</i>, 51(4): 315-321.</p>	<p>9,008 noninstitutionalized individuals over 65</p>	<p>1991–92 Canadian Study of Health and Aging</p>	<p>Basic self-care (toileting, dressing, eating, transferring, grooming)</p> <p>Intermediate self-care (bathing, walking, housework, meal preparation, shopping, walking outside)</p> <p>Complex self-management (handling money, phone use, self-medicating)</p>

Scale Development

National Health Interview Survey

To discover underlying traits that influence respondents' answers to ADL and IADL questions, we conducted two sets of exploratory factor analyses, one with data from NHIS-D and one with data from the Longitudinal Study. The NHIS-D analysis revealed three underlying dimensions, as shown in table A-2.⁵ The first dimension corresponds to gross motor function; the second contains items related to personal care function; and the third set of items involves cognitive function. The gross motor dimension corresponds somewhat to Johnson and Wolinsky's Lower Body Limitation Scale, while the personal care dimension matches their Basic ADL Scale and the cognitive dimension is similar to the Advanced ADL Scale. All but three items load heavily on only one factor. Where items loaded heavily on more than one factor, we grouped them with the factor on which their loading was highest. Table A-3 presents the correlations among these factors. As expected, gross motor function and cognitive function are moderately correlated (.52). Personal care function is more strongly related to gross motor function and to cognitive function (.58 and .65 respectively).

To create scales for these items, we assigned a value of one for each response that indicates a limitation and a value of two for each response that does not indicate a limitation. Next, we took the mean score on all items for each respondent. Therefore, a high score means a higher level of functioning, with a maximum score of two, while a low score means a lower level of functioning, with a minimum score of one.

To confirm that these three scales have acceptable levels of reliability, we calculated Cronbach's alpha for each of them. We present these results in table A-4. Although the reliability coefficient is highest for the gross motor function (.89), all three are within acceptable limits.

⁵ We specified an oblique promax rotation for these analyses. We determined the number of factors based on the number of eigenvalues greater than one.

Table A-2. Exploratory factor analysis of selected ADL and IADL questions from NHIS-D*

Question	Gross motor function	Cognitive function	Personal care function
<i>By yourself and without using aids, do you have any difficulty:</i>			
Standing or being on your feet for about two hours?	.86	-	-
Walking for a quarter of a mile (that is about two or three blocks)?	.86	-	-
Walking up 10 steps without resting?	.85	-	-
Lifting or carrying something as heavy as 25 pounds (such as two full bags of groceries)?	.83	-	-
Stooping, crouching or kneeling?	.81	-	-
<i>Because of a health or physical problem, do you have any difficulty:</i>			
Doing heavy housework, like scrubbing floors or washing windows?	.76	-	-
Managing your money, such as keeping track of expenses or paying bills?	-	.94	-
Managing your medication?	-	.90	-
Preparing your own meals?	-	.77	-
Shopping for groceries and personal items, such as toiletries or medicines?	.60	.74	-
Getting to places outside of walking distance?	.59	.70	-
Getting into or out of bed or chairs?	-	-	.72
Dressing?	-	-	.68
Using the toilet, including getting to the toilet?	-	-	.65
Bathing or showering?	.57	-	.58

Source: National Health Interview Survey-Disability Supplement

* Loadings less than .55 are omitted from this table.

Table A-3. Interfactor correlations among NHIS-D functional status scales

Scale	Gross motor function	Cognitive function	Personal care function
Gross motor function	1.00	0.52	0.58
Cognitive function	0.52	1.00	0.65
Personal care function	0.58	0.65	1.00

Source: National Health Interview Survey-Disability Supplement

Table A-4. Reliability coefficients for NHIS-D functional status scales

Scale	Cronbach's alpha
Gross motor function	.89
Personal care function	.84
Cognitive function	.85

Source: National Health Interview Survey-Disability Supplement

Longitudinal Study of the Vocational Rehabilitation Services Program

The factor analysis in which we used data from the Longitudinal Study also uncovered three underlying dimensions, as shown in table A-5. The first dimension corresponds to gross motor function; the second contains items related to personal care function; and the third set of items involves cognitive function. While the resulting scales did not include exactly the same items as the NHIS-D scales, they appear to measure similar constructs. The Longitudinal Study's gross motor scale includes four of the same items as the NHIS-D gross motor scale, but does not include "standing or being on your feet for about two hours" or "stooping, crouching or kneeling." Likewise, the NHIS-D gross motor scale does not include "getting around outside the house," which is not included in the follow-back survey. While "eating" appears on both instruments, in the NHIS-D survey this item did not load heavily on any of the three factors, so we did not include it in these scales. However, in the Longitudinal Study this item loaded on the

personal care factor, so it is included in this scale. Four items in the Longitudinal Study's cognitive scale, "reading and understanding the newspaper," "writing," "driving" and "using public transportation," appear in the Longitudinal Study questionnaire but not in the NHIS-D survey, while two items, "preparing your own meals" and "getting to places outside of walking distance," appear in the NHIS-D survey but not in the Longitudinal Study instrument. As shown in table A-6, these factors are also correlated with each other. Cognitive function is only moderately related to gross motor function and to personal care function (.31 and .36 respectively). Personal care function is more strongly related to gross motor function (.58).

Table A-5. Factor analysis of Longitudinal Study ADL and IADL items*

Item	Gross motor function	Cognitive function	Personal care function
<i>Are you able to do this by yourself? The activity is</i>			
Walking for a quarter of a mile—about three city blocks	0.77	-	-
Walking up a flight of stairs without resting	0.70	-	-
Doing heavy housework (such as scrubbing floors or washing windows)	0.62	-	-
Lifting and carrying something as heavy as 10 pounds (such as a full bag of groceries)	0.54	-	-
Getting around outside the house	0.52	-	-
Reading and understanding the newspaper	-	0.69	-
Writing	-	0.58	-
Managing your money (such as keeping track of expenses or paying bills)	-	0.61	-
Shopping for personal items (such as toilet items or medicines)	-	0.58	-
Driving	-	0.57	-
Using public transportation	-	0.50	-
Using the toilet, including getting to the toilet	-	-	0.73
Dressing	-	-	0.65
Bathing or showering	-	-	0.64
Getting into and out of bed	-	-	0.64
Eating	-	-	0.50

Source: VR Longitudinal Study

* Loadings less than .40 are omitted from this table.

Table A-6. Interfactor correlations among Longitudinal Study functional status scales

Scale	Gross motor function	Cognitive function	Personal care function
Gross motor function	1.00	0.31	0.58
Cognitive function	0.31	1.00	0.31
Personal care function	0.58	0.36	1.00

Source: VR Longitudinal Study

Based on a review of the items in each scale, we questioned the appropriateness of the items in the cognitive function scale for individuals with visual impairments. Consequently, we tested whether the factor loadings of items on the cognitive scale for individuals with visual impairments differs from the loadings for other individuals by using a confirmatory factor analysis for each group of cognitive function. The loadings for “driving” were significantly different, with a lower loading (.562) for individuals with visual impairments than for other individuals (1.183). As this analysis confirms, the characteristics of vision impairment confound our ability to discriminate based on cognitive function. Therefore, we omitted individuals with visual impairments from our analysis of the reliability of this measure and we do not report cognitive functioning for this subgroup. The results of the reliability analysis for these scales appear in table A-7. All three reliability coefficients are within acceptable limits.

Table A-7. Reliability coefficients for Longitudinal Study functional status scales

Scale	Cronbach’s alpha
Gross motor function	.80
Personal care function	.81
Cognitive function	.82

Source: VR Longitudinal Study

To create the scales for the longitudinal study, we assigned a value of one for each response that indicates a limitation and a value of two for each response that does not indicate a limitation. Next, we took the mean score on all items for each respondent. Therefore, a high score means a higher level of functioning, with a maximum score of two, while a low score means a lower level of functioning, with a minimum score of one.

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