

## Chapter 2

# The VL2 Toolkit Psychometric Study: Summary of Procedures and Description of Sample Characteristics

Thomas Allen and Donna A. Morere

The Toolkit Psychometric Study required extensive planning, discussion, and design work prior to testing, carried out by an interdisciplinary team of researchers affiliated with the Science of Learning Center on Visual Language and Visual Learning (VL2) at Gallaudet University, funded by the National Science Foundation (Cooperative Agreement #SBE0541953). As noted in Chapter 1, our goal was to field test a battery of instruments with a sample of deaf individuals from a variety of backgrounds. In this chapter, we will briefly outline our procedures and present a description of the Toolkit sample, using information from a web-based Background Questionnaire administered to all participants. In the following sections, we describe: protocol development and design, sample recruitment, scoring procedures and data base development, and sample background characteristics.

## Protocol Development and Design

Given the large number of tests selected for the Toolkit, considerable attention was given to assembling protocols and organizing the testing for study participants. The Toolkit was made up of three categories of tests: (1) those published tests that were *adopted* for our use, requiring the purchasing and organizing of published protocols; (2) those that were *adapted* from published tests, requiring the preparation of special materials, such as video-taped ASL presentation of test items, and, in some

---

T. Allen (✉)

Science of Learning Center on Visual Language and Visual Learning, Gallaudet University,  
SLCC 1223, 800 Florida Avenue, NE, Washington, DC 20002, USA  
e-mail: thomas.allen@gallaudet.edu

D.A. Morere

Department of Psychology, Gallaudet University,  
800 Florida Avenue, NE, Washington, DC 20002, USA  
e-mail: Donna.Morere@Gallaudet.edu

cases, procedures for videotaping participant responses to test items; and (3) those that were developed (or were under development) for the current effort. A team of researchers worked on test selection, test procedures, protocol development, order of test administration, and the scheduling of testing.

Once the final set of tests were selected, and the protocols assembled, we estimated that the total testing time for each participant would be approximately 8–9 h. Thus, we decided to divide the testing into three testing sessions per participant. The battery was first divided into two sets of tests: those that focused on audiology, lip reading, and syntactical knowledge, and those that focused on literacy, sign comprehension, and cognition. This division placed roughly one-third of the total assessment time in the former category and two-thirds in the latter. The tests in this latter category were further divided into two sets of tests. Although the assignment of tests to grouping was largely random, care was taken to split tests of similar constructs and methods (for example the ASL and print digit span tests) into different groupings so that they would be administered to the participants on separate days. Furthermore, for each grouping, two randomized orderings of the tests were created, with the additional constraint that tests of memory (for example, the Brief Visuospatial Memory Test and the Morere Signed Verbal Learning Test) required elapsed time between the stimulus training and the recall and recognition assessments. Finally, with two groupings of tests and two randomized orders within each grouping, the orderings were further counterbalanced to ensure that test order would not systematically affect results. A counterbalancing schedule was prepared, and, as participants arrived for testing, they were assigned to the next test ordering on the schedule. The counterbalancing design is presented in Fig. 2.1.

All neuropsychological, literacy, and ASL testing were carried out by members of an assessment team comprised of clinical psychology Ph.D. students who had completed coursework in assessment and had received training in assessment procedures. Dr. Donna Morere, Professor of Psychology at Gallaudet University and a licensed Psychologist specializing in conducting neuropsychological assessments with deaf children (and the first author of this volume), trained and supervised the assessment team. Dr. Morere met regularly with the assessment team, observed the assessment sessions, and maintained the assessment quality throughout the project. The audiological, syntactical knowledge, and lipreading assessments were carried out by Au.D. and MS students at Gallaudet University under the supervision of Gallaudet's Hearing and Speech Center and were coordinated by Drs. Corine Bickley and Mary-June Moseley, Professors in Gallaudet's Department of Hearing, Speech, and Language Sciences (and coauthors of Chap. 12 in this volume).

## Sample Recruitment

Study participants were recruited from the student body of Gallaudet University. Most of the participants were identified through an online volunteer participant pool that is maintained by the VL2 Center. These volunteers are solicited through a

PSYCHOMETRIC STUDY		ORDER OF ADMINISTRATION	
Session Aa	Time	Session Ba	Time
K-BIT 2	20	Corsi Blocks- Computer	5
BVMT-R	5	Digit Span (Fwd & Bwd)- Computer	10
Fingerspelling Test	30	Morere's SVLT	20
BVMTR- Recall, Recognition	5	WCST- 64	20
Letter Span (Fwd & Bwd)	10	Morere's SVLT- Recall	5
BREAK	10	Tower of Hanoi	10
Mental Rotation Task	20	BREAK	10
WJ-PC	10	FAS-ASL	5
Digit Span (Fwd & Bwd)	10	Academic Knowledge	15
Tower of London	10	ASL-SRT	15
Corsi Blocks- Manual	5	Letter Span (Fwd & Bwd)- Computer	10
FAS- English	5	Koo Test	3
Math Fluency	3	PIAT-R	20
TOSWRF	5		
Session Ab	Time	Session Bb	Time
TOSWRF	5	Academic Knowledge	15
Corsi Blocks- Manual	5	FAS-ASL	5
Letter Span (Fwd & Bwd)	10	ASL-SRT	15
FAS- English	5	PIAT-R	20
Tower of London	10	Koo Test	3
Math Fluency	3	BREAK	10
WJ-PC	10	Corsi Blocks- Computer	5
Mental Rotation	20	Morere's SVLT	20
BREAK	10	Letter Span (Fwd & Bwd)- Computer	10
K-BIT 2	20	Tower of Hanoi	10
BVMT-R	5	Morere's SVLT- Recall	5
Fingerspelling Test	30	Digit Span (Fwd & Bwd)- Computer	10
BVMTR- Recall, Recognition	5	WCST- 64	20
Digit Span (Fwd & Bwd)	10		
<b>Counterbalance order:</b>		Aa-Ba; Aa-Bb; Ba-Aa; Ba-Ab Ba-Ab; Ba-Aa; Aa-Bb; Aa-Ba	

Fig. 2.1 Toolkit project counterbalancing design

first-year experience program at the University, through which science educators from VL2 present an introduction to research methods and to the work of the VL2 Center. At the end of the introduction, the students are asked if they would like to sign up for possible participation in a variety of Center research projects. The sample was supplemented by recruiting additional participants on campus through word-of-mouth, flyers, and notices in the daily campus online digest distributed via email to all campus community members. Participants were paid \$45 for each of the three testing sessions.

## **Scoring Procedures and Database Development**

For the published tests with norms, scoring followed the strict scoring protocols provided by the test publishers. For the adapted and newly developed tests, we employed raw scores. Each participant was assigned a unique ID number, which was transcribed onto each protocol. To protect confidentiality, student names were never written onto the protocols themselves. Members of the assessment team were responsible for scoring the protocols. Throughout the process, the scoring proceeded under close supervision of the project's assessment director, Dr. Morere. Since some of the scoring required clinical judgments, the assessment team brought all questions to its weekly meetings for discussion and resolution.

To facilitate the merging of test scores into a database for analysis, a score sheet was developed containing all score elements (included as an Appendix). Scoring was transcribed from the testing protocols to the scoring sheet and double-checked for accuracy and completeness. An online version of the scoring sheet was created for entering score data into a Microsoft Access database. This data entry program also contained data entry routines for entering individual item data for Toolkit assessments with test items that could be scored as right or wrong. All data were double entered for verification. When the data entry was complete, the database was converted to an SPSS system file and merged with data from the Background Questionnaire.

## **Sample Characteristics: The Background Questionnaire**

The VL2 Center employs a standard Background Questionnaire in a number of its studies in order to understand the differences and similarities in characteristics of study participants, using a common set of questions. Given the diversity of the population of deaf individuals in the United States, as well as their low prevalence, and the relatively small sample sizes used in many studies of deaf individuals, it is critical that all empirical investigations of this population report on the characteristics of the samples studied. The VL2 Background Questionnaire resides online and is therefore available to researchers throughout the Center for use in their studies.

The Background Questionnaire includes questions in six sections: (1) demographics; (2) deafness and language/assistive device usage; (3) parents and family members; (4) language history; (5) educational history; and (6) medical information. Below, we present distributional statistics for selected variables within the first five sections. Responses to the questions in Sect. 6 will not be discussed in this chapter.

### ***Section 1: Demographics***

*N.* There were a total of 90 participants in the Toolkit Project. As noted, testing was scheduled in three 2.5–3 h-long sessions. One session took place in the Hearing and

**Table 2.1** Mother and father’s race or ethnic heritage  
(multiple responses allowed)

	Frequency (percent)	
	Mother	Father
African-American	23 (29.1%)	23 (29.1%)
Asian American	5 (6.3%)	3 (3.8%)
European American	40 (50.6%)	40 (50.6%)
Latino/Hispanic	9 (11.4%)	10 (12.7%)
Native American	6 (7.6%)	6 (7.6%)
Other	2 (2.5%)	0 (0.0%)

Speech Center at Gallaudet (for audiological testing, the Test of Syntactic Abilities, and the Lipreading Screening Test). The other two sessions took place in the VL2 Assessment Lab. In all, only 31 (34.4%) participants attended all three sessions; 16 (17.8%) participants attended ONLY one or both of the neuropsychological testing sessions in the VL2 Assessment Lab; 43 (47.8%) attended ONLY the audiological testing in the Hearing and Speech Center. Thus, we have fairly complete neuropsychological data on a total of 47 participants, and fairly complete audiological, syntax, and lipreading data on 74 participants. These distributions unfortunately limit our ability to perform analyses that combine scores from across all sessions. We were unable to randomly assign the full battery of Toolkit tests across all three sessions because the audiology and lipreading testing required special equipment and expertise that resides in the Hearing, Speech, and Language Department at Gallaudet. Because the testing was long, and spread out over several days, some participants decided not to attend all of their scheduled testing appointments.

*Age.* As noted, the sample for this was comprised of students at Gallaudet University at both the graduate and undergraduate levels. The Mean Age for study participants was 25.1 (SD=6.51). The distribution was positively skewed, with 20% of the sample over age 30 and 40% of the sample between the ages of 19 and 21.

*Sex.* The sample was made up of 31.8% males (N=28) and 68.2% females (N=60).

*Parent’s race or ethnic heritage (Table 2.1).* Approximately half of the participants reported that their mother’s and their father’s racial heritage was European American. These figures are similar to national figures derived from a large national sample of 37,352 deaf and hard of hearing school-aged children in the United States from the 2006–2007 Annual Survey of Deaf and Hard of Hearing Children and Youth (Gallaudet Research Institute 2007), in which 47.4% were reported in the “White, non-Hispanic” category. However, the distributions of participants in the current study from non-European American heritages differed markedly from Annual Survey figures. In the current data, 29.1% of the participants reported that they were from African-American families (compared to the national figures showing 15.1% from African-American households). In the current study, 11.4% reported their mothers were of Latino/Hispanic descent; this compares to 28.3% from the Annual Survey. These differences are reflective of student demographics at Gallaudet University.

**Table 2.2** The age at which the participant first became deaf or hard of hearing

Born deaf or hard of hearing	57 (67.1%)
Not born deaf, but became deaf or hard of hearing younger than age 2	7 (8.2%)
Became deaf or hard of hearing at age 2 or older	21 (24.7%)
Total	85 (100.00%)

## ***Section 2: Deafness and Language/Assistive Device Usage***

*Participants' pure tone average (PTA) hearing thresholds in their better ear.* Full audiograms were available for 54 participants. Among this group, five participants (9.3%) showed better ear PTA's in the Less Than Severe category (PTA < 71 dBs). Ten participants (18.5%) were in the Severe category (71–89 dB). The remaining 39 participants (72.2%) were in the Profound category (90 dB or greater). The Background Questionnaire included a question asking participants to self-report their level of hearing loss. For the 36 participants who did not have audiological results, 7 self-rated their hearing loss in the Less Than Severe category; 13 self-rated their hearing loss in the Severe category; 9 self-rated their hearing loss in the Profound category; and 7 did not respond to the question. Using the self-ratings as proxies for the actual audiogram results and aggregating the frequencies yields: 12 participants Less Than Severe (14.5%); 23 participants Severe (27.7%); and 48 participants Profound (57.8%). As a point of comparison, the 2006–2007 Annual Survey reports the following distribution of hearing threshold categories: Less Than Severe (58%); Severe (14.0%); and Profound (28%). The comparison demonstrates the fact that Gallaudet serves students who are predominantly in the Severe to Profound categories, as defined by their audiological results.

*Participants' age at onset of deafness (Table 2.2).* Greater than two-thirds (67.1%) of the participants in the Toolkit sample reported that they had been born deaf or hard of hearing. Another 8.2% reported that they had become deaf or hard of hearing before their second birthday. In the national figures from the 2006–2007 Annual Survey, these numbers are 40.9% and 15.5%, respectively. Thus, the Toolkit sample was comprised of individuals with much earlier ages of onset than the national sample. This can be attributed to the fact that Gallaudet University more often attracts deaf students with longer histories of deafness than those with later onsets. This is a critical aspect of the Toolkit sample, as deaf individuals who are either born deaf or who become deaf in their first 2 years of life will have little or no exposure to spoken language in their earliest months, during a sensitive developmental period for language acquisition.

*Participants' language preference (Table 2.3).* Over 90% of the participants reported a preference for ASL, and close to 14% reported a preference for English with Sign Support. (Multiple responses were allowed for this variable, so participants could select more than one preference.) These results are consistent with Gallaudet's mission as a bilingual ASL-English University. The Annual Survey reports on the primary mode (not language) of communication used in instruction. In the 2006–2007 school year, only 11.2% of deaf and hard of hearing students

**Table 2.3** Participants’ language preferences

Language preferences	Frequency (%)
ASL	79 (90.8%)
Spoken English	19 (21.8%)
English with Sign Support	12 (13.8%)
Other	5 (5.7%)
Total Respondents	87

**Table 2.4** If participants had ever used a hearing aid and/or cochlear implant

	Hearing aid	Cochlear implant
Yes	80 (93.0%)	4 (4.7%)
No	6 (7.0%)	82 (95.3%)
Total	86 (100.00%)	86 (100.00%)

**Table 2.5** If participants currently use a hearing aid or cochlear implant

	Hearing aid	Cochlear implant
Yes, regularly	22 (27.5%)	3 (75.0%)
Yes, but only occasionally	13 (16.2)	
No	45 (56.2%)	1 (25.0%)
Total	80 (100.00%)	4 (100.00%)

nationwide were reported in “Sign Only” classrooms; 35.5% were reported from “Sign with Speech”; and 51.6% were reported in “Speech Only” classrooms. Thus, the Toolkit sample contained a far higher proportion of individuals with a preference for using ASL (and a high percentage of Gallaudet’s classes are “sign only”). Again, the comparisons of our participant characteristics with national student data demonstrate Gallaudet University’s mission and its student demographics.

*Hearing aid and cochlear implant usage (Tables 2.4 and 2.5).* A large majority of Toolkit participants (93.0%) reported that they had, at some point in their lives, used a hearing aid. However, among those that had previously used a hearing aid, over half (56.2%) reported that they were no longer using one, and only 27.5% reported regular hearing aid use. These 22 individuals (noted in Table 2.4) who reported regular hearing aid use comprised only 25.5% of the full participant sample. The modal reasons given for why participants had stopped using their hearing aids were: no perceived benefit ( $N=18$ ); pain, headache, or discomfort ( $N=9$ ); social factors ( $N=7$ ); too noisy ( $N=7$ ); and lost or broken ( $N=6$ ). The Annual Survey does not report on whether the children reported to the survey had ever used a hearing aid, but it does report whether students are currently using a hearing aid in instruction. In 2006–2007, 58.7% were reported as using a hearing aid in instruction. Thus, Toolkit participants were considerably less likely to be regular current hearing aid users than those from the national Annual Survey data.

Regarding the use of cochlear implants, only four Toolkit participants reported that they had ever used a cochlear implant, and three of these four reported that they

**Table 2.6** Participants' reporting of which parents had raised them

Both a mother and father	62 (70.5%)
Only by the mother or a female guardian	23 (26.1%)
Only by the father or a male guardian	1 (1.1%)
Other	2 (2.3)
Total	88 (100.00%)

**Table 2.7** Deaf/hearing status of mother and father

	Mother	Father
Deaf	22 (25.6%)	18 (28.1%)
Hard of hearing	3 (3.5%)	5 (7.8%)
Hearing	61 (70.9%)	41 (64.1%)
Total	86 (100.00%)	64 (100.00%)

Both parents hearing: ( $N=38$ , 60.3%)

Both parents deaf or hard of hearing: ( $N=18$ , 28.6%)

One parent deaf or hard of hearing: ( $N=7$ , 11.1%)

(These percentages based on the 63 participants reporting deaf/hearing status for BOTH parents)

were current, regular users of their implant. In the 2006–2007 Annual Survey, 12.6% were reported as having ever had an implant, 92.2% of whom were currently using their implant in instructional settings.

### ***Section 3: Parents and Family Members***

*Which parents had raised the participants (Table 2.6).* Over two-thirds (70.5%) of the participants in the Toolkit project reported that both a mother and a father had raised them, while over a quarter (26.1%) reported being raised by only a mother or a female guardian. While there are no comparable figures from the Annual Survey for deaf and hard of hearing youth nationwide, comparisons to U.S. National Census data reveal that the Toolkit participant sample is highly similar to the US population at large. The US Census reports that, in 1995, 69% of children under age 18 lived with two parents and 27% lived with only one parent (U.S. Department of Commerce 1997). As noted by the Census, being raised by a single mother can be associated with lower socioeconomic status (though only for never-married mothers and not for divorced or widowed mothers).

*Parents' deaf/hearing status (Table 2.7).* While 70.9% of the participants reported having a hearing mother, and 64.1% reported a hearing father, only 60.3% reported having both a hearing mother and a hearing father. Thus, near 40% of the participants had at least one deaf or hard of hearing parent. It should be noted that only 63 participants reported data on both parents. Quite obviously, this is due to the fact that 23 participants reported being raised by only a mother, as noted in Table 2.6, and is likely that they were unaware of the deaf/hearing status of their fathers. An examination of



**Table 2.8** Reported levels of parents' highest educational levels

	Mother	Father
Some high school, but no diploma	9 (11.7%)	9 (15.8%)
High school diploma	25 (32.5%)	23 (40.4%)
Some college, but no BA/BS	15 (19.5%)	9 (15.8%)
BA/BS	15 (19.5%)	11 (19.3)
Some graduate school, but no MA/MS	1 (1.3%)	0 (0.0%)
MA/MS	7 (9.1%)	2 (3.5%)
Some post-masters courses, but no Ph.D.	1 (1.3%)	0 (0.0%)
Doctorate (Ph.D., MD, Ed.D, etc.)	4 (5.2%)	3 (5.3%)
Total	77 (100.0%)	57 (100.0%)

**Table 2.9** Reported sign use while participants were growing up

Parents sign use while respondent was growing up	Mother	Father
Yes, well enough to communicate with me fully and effectively	49 (56.3%)	25 (39.1%)
Yes, but only basic signs	18 (20.7%)	17 (26.6%)
No	20 (23.0%)	22 (34.4%)
Total	87 (100.00%)	64 (100.00%)

these 23 participants reporting single mothers had raised them reveals that 17 of them (73.9%) reported that their mothers were hearing.

Comparisons to Annual Survey numbers reveal that the Toolkit participants were more likely to have one or both deaf or hard of hearing parents than those reported in the national data. In the 2006–2007 Annual Survey, 83.4% of the children were reported from families where both parents are hearing, but only 3.8% are reported from families where both parents are deaf or hard of hearing. (The remaining were reported as: one deaf or hard of hearing and one hearing, 4.4%; one deaf or hard of hearing and the other unknown, 1.0%; and one hearing and the other unknown, 7.4%.)

*Parents' highest levels of education (Table 2.8).* There was wide variability in educational attainment levels reported for the participants' parents. More than 71% of the fathers and more than 63% of the mothers were reported as having achieved only a high school diploma or below (including those with some college, but no college degree). At the same time, 28.1% of the fathers and 36.4% of the mothers had had attained a BA degree or above. These figures compare well to U.S. Census data that reports, for 2010, 70% of the United States population aged 25 or older attaining, at most, a high school diploma, and 30% attaining a college degree.

*Parents' knowledge of and use of signs while respondents were growing up (Table 2.9).* As noted in the above sections, 85% of the participants had levels of hearing loss in the severe to profound range, 75% reported that they were born deaf or became deaf before the age of 2, and 91% reported ASL as a language preference. Nonetheless, over half of the participants reported that their parents either did not know or use signs with them while they were growing up or that they only used basic signs but were unable to communicate in signs "fully or effectively." We have no national-level comparisons for this finding, but note that these data suggest considerable variation in the early language experiences for study participants. We will return

**Table 2.10** Self-reported knowledge of selected languages and modalities

	ASL	Signed English	Spoken English	Lip reading	Cued English
Yes	86 (97.7%)	57 (64.8%)	58 (65.9%)	72 (81.8%)	4 (5.0%)
No	2 (2.3%)	31 (35.2%)	30 (34.1%)	16 (18.2%)	76 (95.0%)
Total	88 (100.00%)	88 (100%)	88 (100%)	88 (100%)	80 (100%)

**Table 2.11** Reported sources of acquisition for languages and modalities

	ASL	Signed English	Spoken English	Lip reading	Cued English	Written English
Parents	37 (42.5%)	16 (26.7%)	46 (79.3%)	49 (68.1%)	1 (25.0%)	63 (71.6%)
Siblings	19 (21.8%)	8 (13.3%)	36 (62.1%)	31 (42.1%)	1 (25.0%)	32 (36.4%)
Friends	62 (71.3%)	23 (38.3%)	33 (56.9%)	32 (44.4%)	2 (50.0%)	43 (48.9%)
Teachers	76 (87.4%)	45 (77.0%)	46 (79.3%)	44 (61.1%)	1 (25.0%)	85 (96.6%)
Other	21 (24.1%)	11 (18.3%)	17 (29.3%)	24 (33.3%)	1 (25.0%)	9 (10.2%)
Total	87 (100%)	60 (100%)	58 (100%)	72 (100.0%)	4 (100.0%)	88 (100.0%)

to these differences in the final chapter of this book, where we present an analysis of test performance, and its relationship to reported early communication experience.

## Section 4: Current Language Use and Language Histories

*Knowledge of languages and modalities (Table 2.10).* With the exception of Cued English, Toolkit Study participants rated themselves highly as knowing ASL (97.7%) and English in signed (64.8%), spoken (65.9%), and lipreading (81.8%) modalities. Only four participants rated themselves as having competence in Cued English. We emphasize that these are self-reports provided by the study participants and are not based on objective measures.

*Sources of language acquisition (Table 2.11).* While 79.3% of the participants reported their parents as a one of the sources of their knowledge of spoken English (among those 58 participants who indicated competence in spoken English), and 71.6% reported their parents as one of the sources of their knowledge of written English, only 42.5% reported that their parents were a source of ASL acquisition. As the data show, friends and teachers were most often reported as the source of ASL acquisition (71.3% and 87.4%, respectively). Teachers were most often reported as one of the sources for signed English acquisition (77% of those 60 participants who reported competence in signed English), spoken English acquisition (79.3% of those 58 participants reporting competence in spoken English), and written English acquisition (96.6% of those 88 participants reporting competence in written English).

*Frequency of language use (Table 2.12).* Overwhelmingly, Toolkit participants reported either “All the time” or “daily” use of both ASL (96.5%) and written English (97.8%). Interestingly, for those participants reporting competence in signed

**Table 2.12** Frequency of use for different languages and modalities

	ASL	Signed English	Spoken English	Lip reading	Cued English	Written English
All the time	67 (77.9%)	5 (8.6%)	18 (31.0%)	18 (25.0%)	0 (0.0%)	57 (64.8%)
Daily	16 (18.6%)	13 (22.4%)	19 (32.8%)	20 (27.8%)	2 (50.0%)	29 (33.0%)
Few times a week	2 (2.3%)	11 (19.0%)	10 (17.2%)	12 (16.7%)	0 (0.0%)	1 (7.1%)
Once a week	0 (0.0%)	0 (0.0%)	1 (1.7%)	4 (5.6%)	1 (25.0%)	0 (0.0%)
Once a month	0 (0.0%)	1 (1.7%)	2 (3.4%)	4 (5.6%)	0 (0.0%)	0 (0.0%)
<Once a month	0 (0.0%)	15 (25.9%)	1 (1.7%)	4 (5.6%)	1 (25.0%)	0 (0.0%)
Special occasions	1 (1.2%)	13 (22.4%)	7 (12.1%)	10 (13.9%)	0 (0.0%)	1 (1.1%)
Total	86 (100.0%)	58 (100.0%)	58 (100.0%)	72 (100.0%)	4 (100.0%)	88 (100.0%)

**Table 2.13** When participants began using different languages and modalities

	ASL	Signed English	Spoken English	Lip reading	Cued English	Written English
Before school	34 (39.1%)	17 (30.4%)	35 (60.3%)	22 (31.0%)	0 (0.0%)	32 (36.4%)
Elementary	24 (27.6%)	29 (51.8%)	21 (36.2%)	33 (46.5%)	1 (25.0%)	51 (58.0%)
Middle/Jr.	8 (9.2%)	4 (7.1%)	1 (1.7%)	12 (16.9%)	3 (75.0%)	4 (4.5%)
HS	14 (16.1%)	3 (5.4%)	1 (1.7%)	2 (2.8%)	0 (0.0%)	1 (1.1%)
After HS	7 (8.0%)	3 (5.4%)	0 (0.0%)	2 (2.8%)	0 (0.0%)	0 (0.0%)
Total	87 (100%)	56 (100%)	58 (100.0%)	71 (100.0%)	4 (100.0%)	88 (100.0%)

English, spoken English, and lipreading, usage was far less frequent. Only 31% of those reporting competence in signed English reported using it all the time or daily; 63.8% of those reporting competence in spoken English reported all the time or daily use; 52.8% of those reporting competence in lipreading reported all the time or daily use. Thus, in the Toolkit sample, ASL and Written English are the predominant languages and modes of communication, with other modalities of spoken English used considerably less often.

*Ages when different languages and modalities were first used (Table 2.13).* Even among those participants reporting competence in ASL, only 39.1% reported that they had begun using ASL before starting elementary school. Among those reporting competence in written English, only 36.4% reported that they began using written English before starting school. As noted, these two groups essentially comprise the entire Toolkit sample. Thus, a majority of the participants in the Toolkit sample did not begin using the languages that they report currently using “all the time” or “on a daily basis” until after starting school. Among those 58 participants who self-reported competence in spoken English, 60.3% reported that they began using spoken English before starting school. While this is a higher percentage than that reported for ASL use, it should be kept in mind that the 58 participants in this group comprise 64% of the participant pool. In general, the prevalence of all language use before elementary school is low for participants in the Toolkit sample.

## ***Section 5: School and Instructional Mode of Communication History***

*Types of schools attended (Table 2.14).* Participants exhibited considerable mobility among different educational programming options throughout their schooling. Across the school range from preschool to college, 74.1% reported that they had attended a mainstream program at some point in their educational lives, 55.1% had attended a deaf education classroom in a public school, 28.1% had attended a day school for the deaf, and 59.6% had attended a residential school for the deaf.

**Table 2.14** Types of schools participants report attending at different educational levels

	Mainstream	Deaf ed. classroom in public school	Day SFD	Deaf residential school
Preschool	39 (43.8%)	23 (25.8%)	15 (16.9%)	12 (13.5%)
Elementary	45 (50.6%)	34 (38.2%)	14 (15.7%)	24 (27.0%)
Middle/Jr.	46 (51.7%)	22 (24.7%)	10 (11.2%)	34 (38.2%)
HS	44 (49.4%)	17 (19.1%)	8 (9.0%)	49 (55.1%)
College	19 (21.3%)	6 (6.7%)	10 (11.2%)	44 (49.4%)
Total respondents	66 (74.1%)	49 (55.1%)	25 (28.1%)	53 (59.6%)

Note: All percentages are based on the 89 participants who responded to this set of questions

**Table 2.15** Languages used in instruction

	ASL	Signed English	Spoken English	Non-English spoken Language	Sign Language Not ASL	Cued speech
Preschool	34 (38.2%)	27 (30.3%)	39 (43.8%)	0 (0.0%)	1 (1.1%)	3 (3.4%)
Elementary	46 (51.7%)	39 (43.8%)	39 (43.8%)	4 (4.5%)	4 (4.5%)	3 (3.4%)
Middle/Jr.	61 (68.5%)	24 (27.0%)	35 (39.3%)	3 (3.4%)	2 (2.2%)	1 (1.1%)
HS	74 (83.1%)	21 (23.6%)	35 (39.3%)	3 (3.4%)	3 (3.4%)	1 (1.1%)
College	81 (91.0%)	15 (16.9%)	30 (33.7%)	2 (2.2%)	3 (3.4%)	1 (1.1%)
Total	84 (94.3%)	52 (58.4%)	45(50.6%)	6(6.7%)	7(7.9)%	4 (4.5%)

Note: All percentages are based on the 89 participants who responded to this set of questions

The sum of these percentages (216.9 cumulative percent points and a total of 193 different school types indicated across the range) suggests that each participant reported, on average, 2.169 different types of schools attended. Throughout the elementary to high school range, the percentage of participants who reported attending mainstream programs remains relatively constant (although this does not necessarily imply that the same participants remained in mainstream programs throughout their schooling). At the same time, the percentages of participants reporting attendance in deaf education programs in the public school and at day schools for deaf decrease systematically from elementary to high school, while the percentages of participants attending residential schools show a systematic increase across these levels. These shifts suggest greater migration among self-contained educational options, resulting in higher percentages of participants moving from day programs to residential schools in the later school years.

*Languages of instruction at different educational levels (Table 2.15).* Across all educational levels from preschool to college, 94% of participants report the use of ASL at some point in their schooling. The reported instructional use of ASL increased systematically for the participants: 38.2% reported the use of ASL in preschool, 51.7% in elementary, 68.5% in middle school, 83.1% in high school, and 91% in college. The prevalence of reported Signed English and Spoken

English use is lower (58.4% and 50.6% respectively). Across the school levels, the reported use of spoken English stays fairly constant throughout elementary school (43.8%), middle school (39.3%), and high school (39.3%). The use of signed English, however, decreases systematically across the school levels from elementary school (43.8%) to middle school (27.0%), to high school (23.6%), and to college (16.9%).

## Summary

In this chapter, we have described the procedures we followed in conducting the Toolkit Project and presented an analysis of the sample characteristics using data from a Background Questionnaire developed for use by a number of different research projects conducted in the VL2 Center. The questionnaire includes questions about demographics, factors related to deafness and the use of languages and assistive technologies, parent and family information, and language and education histories.

When we compare the profiles of the Toolkit participants to those of a large national sample of deaf and hard of hearing children, as reported in the national summary of the 2006–2007 Annual Survey of Deaf and Hard of Hearing Children and Youth (Gallaudet Research Institute 2007), a considerable number of differences can be noted. Our sample contains a higher percentage of individuals with severe to profound levels of hearing loss than those reported to the Annual Survey. Our participants are more likely to come from families who sign. They are more likely to have one or both deaf or hard of hearing parents. They are more likely to have become deaf before the age of 2.

These differences mitigate the broad generalization of our study results to the national population of deaf and hard of hearing students. On the other hand, the greater homogeneity of our participants with respect to these variables serves the purposes of our project quite well. Our intent is to examine a set of literacy, language, and neuropsychological measures for use with individuals who have had little or no exposure to sound and who have relied to a great extent on visual processes and visual languages for learning. It is precisely these individuals for whom current assessment practices are the most risky, and for whom a systematic study of test properties would prove the most beneficial. It is also hoped that an in-depth examination of the correlational patterns and underlying cognitive factors demonstrated in our results will contribute to a greater understanding of the unique cognitive processes of deaf learners. For these varied purposes, we believe the unique nature of the participant sample assembled for this project has particular merit.

## Appendix

Page 1 of 2 (revised 11/30)		Birthdate:		Age:		Examiner Name:	
Subject ID#:		VL2 ID#:					
PARTICIPANT SCORING SUMMARY							
Session <input type="text"/>						Session <input type="text"/>	
Date of Testing:		Raw	Z/T/SS*	%ile	Code	Date of Testing:	
		Raw	Z/T/SS*	%ile	Code		
VISUOSPATIAL							
BVMT-R Form <input type="text"/>				>16% =50 T		Mental Rotation Task <input type="text"/>	
Trial 1							
Trial 2							
Trial 3							
Total Recall							
Delayed Recall							
Discrimination Index							
ACHIEVEMENT			SS / Age Equivalent			SS / G.E.	
PIAT-R Reading Comprehension							
TOSWRF							
WJ-Test of Achievement							
Reading Fluency						Passage Comprehension	
Writing Fluency						Math Fluency	
Academic Knowledge							
GENERAL COG. FUNCTIONING	Raw	Z/T/SS*	%ile	Code		Raw	Z/T/SS*
WCST - Total Correct					Tower of London		
Total Errors					Total Correct Score		
Perseverative Errors					Total Move Score		
Categories Completed					Timed Violations		
Trials to Complete 1 <sup>st</sup> Cat.							
Failure to Maintain Set					FAS: Total Score		
Tower of Hanoi					Animals	Food	
Total Score (31-119 moves =1 point)							
Total Moves							
Total Time (min:sec)							
K-BIT 2 - Matrices							
Koo Test: Total Score							
/k/ in C		/k/ in CH					
/s/ in C		/g/ in G					
/f/ in G							

## References

- Gallaudet Research Institute. (2007, December). *Regional and national summary report of data from the 2006–2007. Annual survey of deaf and hard of hearing children and youth*. Washington, DC: GRI, Gallaudet University.
- U.S. Department of Commerce. (1997). *Census brief: Children with single parents—How they fare (Publication CENBR/97-1)*. Washington, DC: U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census.



Assessing Literacy in Deaf Individuals  
Neurocognitive Measurement and Predictors  
Morere, D.; Allen, Th. (Eds.)  
2012, XVI, 268 p., Hardcover  
ISBN: 978-1-4614-5268-3