

# Assessing Adult Literacy by Telephone

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*Several industrialized nations have conducted expensive door-to-door surveys of adult literacy. Following a critique of the role of knowledge in literacy, the research presented here examined the construct and action validity of the use of simple checklists to assess the declarative knowledge component of adult's literacy by telephone. Significant relationships were found among knowledge when assessed either by listening (telephone) or by reading (mailed questionnaire) modality. The telephone data showed similar relationships to demographic variables that have been found in the 1993 National Adult Literacy Survey and other literacy surveys during the last half-century. It was concluded that the telephone method may provide a valid, cost-effective alternative to door-to-door assessments of literacy.*

**H**ISTORICALLY, NATIONAL ASSESSMENTS OF ADULT LITERACY have been valued by adult educators, because they served the generally useful purpose of keeping the issue of adult literacy visible to policymakers, business and industry leaders, labor unions, educators, and adults themselves who may be stimulated to seek additional literacy development (Fagan, 1994). Recently, however, the assessment of adult literacy in industrial nations has taken on a new significance (The Organization for Economic Cooperation and Development [OECD], 1995). The OECD noted that, in regard to concerns for economic competitiveness among member nations, “one area that is receiving growing attention from educational policymakers and analysts in a number of OECD countries is the direct measurement of literacy levels in the labor force of industrialized countries” (Benton & Noyelle, 1992, p. 11).

The OECD report went on to note that, because the costs of such direct assessments are great, some nations may be reluctant to undertake them, or if they do, they may resist performing follow-up assessments to determine changes in adult literacy. In the United States, for instance, discussions of the National Governor’s Association noted that the National Adult Literacy Survey (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993), conducted by the National Center for Education Statistics of the US Department of Education, had been very expensive to administer – over \$14 million for the national and state samples involved (A. Kolstad, personal communication, 1994) – hence, it was not scheduled for readministration (Prince, 1994).

The National Adult Literacy Survey assessed literacy by personal interviews; it asked adults to perform tasks such as filling out a bank check, locating times for travel in a train schedule, calculating the cost of a meal in a restaurant, and other types of “tasks that simulate the literacy demands that adults encounter in their daily lives” (Campbell, Kirsch, & Kolstad, 1992, p. 12). To avoid the costs of door-to-door assessments, the US Department of Education has also used statistical regression techniques, based on data from the National Adult Literacy Survey, to estimate the literacy levels of adults in states that did not participate in the national survey (Reder, 1994b). In Canada, too, concerns for the cost of administering direct assessments of adult literacy led the Department of the Secretary of State to explore the use of proxy measures of adult functional literacy to predict the direct assessment data (Neice, Adsett, & Rodney, 1992).

Statistical techniques and proxies for literacy assessment are of limited educational use when they include variables such as ethnicity and gender (Reder, 1994b) or learning disabilities and mother’s educational level (Neice et al., 1992) in estimating people’s literacy skills. These variables are not amenable to change by education or training, and hence, recommendations for action in the form of educational interventions are not feasible.

The present study, like the proxy studies above, was motivated by the need to find a more cost-effective method for assessing the literacy skills of adults than direct door-to-door testing. Instead of using proxy variables (variables that substitute for literacy), the present study involved the assessment of one component

of literacy, the knowledge used in comprehending language during either reading or listening. In this approach, knowledge was assessed by telephone using the checklist methodology developed by Stanovich and associates (see Stanovich, 1993, for a general summary of this research; also see Stanovich & Cunningham, 1993). Telephone surveys are less expensive than door-to-door surveys, but the validity and utility of the data must be established in comparison to existing approaches of assessing adult literacy. This study focused on questions of the validity and utility of a telephone survey methodology for assessing adult literacy ability.

The issue of validity is controversial yet central to all assessments of literacy or other cognitive skills, whether for children or adults (Messick, 1988, 1989). Therefore, before discussing the specific questions addressed in this study, we first address general issues of validity that have arisen in discussions of national assessments of adult literacy. Next, we discuss the theory of literacy guiding the research for assessing adult literacy by telephone. Then, following the description of the methodology, the results section presents convergent and discriminant evidence for the construct validity of the theory of literacy. Finally, the discussion section presents evidence for the action validity (Messick, 1989) of the telephone survey by comparing the telephone survey approach with the National Adult Literacy Survey door-to-door approach in producing informational products deemed useful by us government agencies that have supported these large-scale assessments.

### *Issues of Validity*

Despite the several adult literacy surveys that have been conducted in the United States in the last half-century (Sticht & Armstrong, 1994), the validity of the general practice of governments in conducting large-scale assessments of people's literacy skills has not gone unchallenged. For instance, Kazemek (1990) stated:

attempts at defining "ability levels" and "norms" are not only futile but potentially dangerous as well. How can we possibly arrive at acceptable definitions of literacy when there are countless life goals, needs, and desires among the adult populations? Realistically we cannot, but in our attempts to do so we usually produce reductive lists, scales, and criteria ... which are then used to categorize large segments of the population, often in detrimental ways. (p. 56; see also papers in Venezky, Wagner, & Ciliberti, 1990)

Kazemek's questioning of the validity of large-scale assessments of adult literacy in terms of both the way one defines and measures literacy and the way one uses the scores from such assessments raises concerns addressed by Messick's (1988, 1989) discussions of validity. We follow Messick's idea of validity as a "unified concept" with different facets in which the validity of an assessment refers to the validity of the inferences one makes from the data. One facet of the

validity of test scores is the traditional concept of construct validity. Messick (1989) referred to this as the validity of interpretive inferences and stated, "To validate an *interpretative inference* is to ascertain the extent to which multiple lines of evidence are consonant with the inference, while establishing that alternative inferences are less well supported. This represents the fundamental principle that both convergent and discriminant evidence are required in test validation" (p. 5, italics added). Evidence of convergent validity evidence arises when correlations of literacy scores are found with other variables (e.g., years of education, amount of reading) and when these relationships are predicted by the theory of literacy underlying an assessment. Evidence of discriminant validity arises when variables that the theory of literacy predicts should not be related are, in fact, unrelated in the data.

Kazemek's questioning of the definitions and operations used to assess adult literacy is a challenge to the construct or interpretative validity of the assessments. His questioning of the uses of test scores, including detrimental uses, is addressed by Messick in the facet of validity that he called action inferences. He stated, "To validate an *action inference* requires validation not only of score meaning but also of value implications and action outcomes, especially of the relevance and utility of the test scores for particular applied purposes and of the social consequences of using the scores for applied decision making" (Messick, 1989, p. 5, italics added). In the present study, evidence for action validity was adduced in the comparison of the telephone and National Adult Literacy Surveys as means for producing information valued by the US Congress, the branch of government that requested the National Adult Literacy Survey in federal legislation.

### *The Theory of Literacy for the Telephone Survey*

The general theory underlying the telephone and checklist approach to adult literacy assessment is based on the "modal model of memory" which has been examined in over 30 years of research (Healy & McNamara, 1996, p. 143). Simply stated, this model conceives of a human cognitive system that includes both a knowledge base in long-term memory consisting largely, though not exclusively, of language-based declarative and procedural knowledge, and a working memory in which active information processing takes place using the knowledge from long-term memory and information picked up from the external world through a perceptual system. Generally speaking, highly literate individuals possess large bodies of knowledge and information processing capacity and efficiency in working memory to process information in complex graphic documents (Kyllonen & Christal, 1990).

How do the highly literate obtain these vast bodies of knowledge and efficient information processing skills such as those used in the automatic recognition of written words? Several lines of research have converged, suggesting that people become highly literate largely by engaging in numerous literacy practices,

such as reading books, magazines, newspapers, and so forth (Krashen, 1993; Reder, 1994a). A review of the major assessments of adult literacy in the United States since 1937 consistently revealed that, as years of education increase, there are corresponding increases in both the number of literacy practices in which adults engage and the amount of skill displayed in the assessments (Sticht & Armstrong, 1994).

In an illuminating program of research, Stanovich and associates (Stanovich, 1993; Stanovich & Cunningham, 1993) explored how the extent of engagement in literacy practices by children and adults contributed to their development of literacy and, more broadly, “verbal intelligence.” Using an innovative method for assessing knowledge, with checklists calling for a simple yes or no judgment on the part of the reader, Stanovich and associates demonstrated that performance on these checklists correlated significantly with a variety of literacy activities and cognitive assessments (Allen, Cipielewski, & Stanovich, 1992; West, Stanovich, & Mitchell, 1993). A major conclusion from this body of research is that the simple checklists assess knowledge indicative of (a) the *extent of use* that one makes of printed and written materials, (b) the *knowledge* one derives from the use of these materials, and (c) the *added potential* for engaging in future literacy practices as a consequence of having a broader base of knowledge prerequisite for wide-ranging reading.

In these studies, Stanovich and associates argued that individuals who read a lot acquire, mostly through incidental learning, a large declarative knowledge base containing the names of authors; magazines; newspapers; persons known for their contributions to film, theater, music, and other activities that Hirsch (1987) referred to as “cultural literacy”; and a large vocabulary of words typically not encountered with high frequency in day-to-day oral communication or on television or radio. Scores on these checklists are indicators of both the amount of reading in which individuals engage and of the cognitive outcomes in terms of the individual’s declarative knowledge base (see comments by Taylor, 1994, and reply by Stanovich & West, 1994, regarding contrasting perspectives on the use of the checklist methodology for studying reading behavior).

### *Using the Stanovich Checklists to Assess Literacy by Listening*

The checklist approach to knowledge assessment developed by Stanovich and associates lends itself readily to the assessment of knowledge by listening, because research indicates that, beyond the period of reading in which early decoding skills are developed, listening and reading converge on the same knowledge base (Sinatra, 1990; Stanovich, 1991; Sticht, Beck, Hauke, Kleiman, & James, 1974; Sticht & James, 1984). The theory that both listening and reading share a common knowledge base, which is composed of both language (grammar, with lexicon and syntax) and language-based meanings, means that in individuals the processes of listening and reading are very largely the same at the level of the

knowledge base (Sticht, 1978; Sticht & McDonald, 1992). In the individual's mind, listening and reading processes are not correlated, rather, they are structurally the same with regard to the knowledge base that they draw upon (with only slight differences due primarily to the nature of the informational displays involved in speaking and writing). Because individual differences exist in the amount of knowledge that individuals possess, listening and reading will tend to be moderately to highly correlated in the adult population, meaning that low, medium, and highly knowledgeable adult listeners will also be low, medium, and highly knowledgeable readers (Sticht, Hooke, & Caylor, 1981). The correspondence of listening and reading processes at the level of the knowledge base forms the mechanism for assessing the knowledge component of literacy by telephone.

### *Knowledge As an Indicator of Literacy Ability*

There is a knowledge component (words, sentences, paragraphs) in all of the myriad literacy tasks in which people engage in our information-age society. This suggests that the knowledge component can be used as an indicator of literacy ability. The assessment of knowledge as distinct from the performance of complex tasks that include knowledge, along with various types of information processing tasks of unknown qualities, is also warranted when the definition of literacy adopted by the advisory panel of experts for the National Adult Literacy Survey is examined (despite Kazemek's, 1990, assertion that agreement could not be reached on a definition of literacy). The definition of literacy agreed to was: "Using printed and written information to function in society, to achieve one's goals, and to *develop one's knowledge* and potential" (Kirsch et al., 1993, pp. 2-3, italics added). The importance of knowledge in literacy was also acknowledged by the advisory panel for the National Adult Literacy Survey in its acceptance of the definitions of the three different literacy scales (prose, document, quantitative) that were developed. In each case, literacy was defined as "the knowledge and skills" needed to perform the three types of literacy tasks. From these definitions, it is clear that the advisory panel for the National Adult Literacy Survey understood that the use of printed and written information to accomplish tasks requires certain knowledge and skills to make such use possible. Strictly speaking, therefore, literacy is not "using printed or written material to function in society, etc." as stated in the advisory panel's agreed on general definition, but the *prerequisite knowledge and skills* that make the use of printed and written materials possible.

In the telephone survey methodology, the respondent's knowledge was assessed using lists containing discrete items, such as names or single vocabulary words, that required only a yes or no decision for each item. Such lists are suitable for presentation by telephone for listening and by written checklists for reading, because they do not overload working memory and introduce irrelevant task

variance (Messick, 1989). In contrast, the National Adult Literacy Survey used literacy tasks that emphasized “search and locate” (Guthrie, Britten, & Barker, 1991) information processing skills, requiring participants to hold instructions in working memory while performing search and locate actions and problem-solving (make inferences, reason) to accomplish unfamiliar tasks (Kirsch et al., 1993, p. 9; Kirsch & Mosenthal, 1990, pp. 5–30; Mosenthal & Kirsch, 1991, pp. 147–179).

National Adult Literacy Survey data for adults above age 54 show a rapid decline of performance (Kirsch et al., 1993). Because it is well established that working memory becomes increasingly less efficient with advanced age (Bernstein, Roy, Srull, & Wickens, 1988; Meyer, Marsiske, & Willis, 1993), these findings strongly suggest that the National Adult Literacy Survey tasks derive a great deal of their difficulty from the load they placed on working memory, and this may threaten their validity as literacy measures for the elderly. Additionally, the National Adult Literacy Survey methodology introduces unknown and possibly irrelevant test variance, which may lead to serious underestimations of the breadth of materials that older adults can read and comprehend using their knowledge base, and the tasks they can perform in working memory given sufficient time to study materials without the pressure for efficiency typical of test-taking situations. The latter tasks are of questionable ecological validity in the lives of most adults over the age of 25 who are not in school.

### *Questions for the Present Study*

This study investigated the assessment of the knowledge component of adult literacy using telephone interviews as the mode of presentation, listening as the mode of reception, and the Stanovich checklists to assess aspects of the declarative knowledge base likely to be developed by reading. Several questions were explored:

1. *Does an oral presentation of checklists by telephone, which requires listening ability, produce results consistent with a written presentation of the checklists, which requires reading ability?* To address this question, we correlated results of the checklists for participants who responded first to the checklists by telephone and then to a written version of the checklists that was mailed to them. Consistently positive and statistically significant correlations would support the construct validity of the telephone survey; such findings constitute evidence that the telephone and written checklists measured the same construct, namely the internal knowledge base of the participants.

2. *Do the knowledge scores obtained using the checklist and telephone survey methodology correlate significantly with scores on another frequently used method for assessing reading literacy?* To answer this question, we administered a cloze test to the same subsample of the telephone survey participants who also responded to the written version of the checklists. Positive and significant

correlations of the telephone knowledge test scores with the cloze test scores offer evidence for the construct validity of the telephone survey as an indicator of reading ability beyond the checklists themselves.

3. *Do the knowledge checklist scores from the telephone survey show positive relationships with demographic variables, such as years of education, parents' years of education, amount of reading, and so forth, that have been found in other major assessments of adult literacy?* If so, this finding would provide convergent evidence that the theory (construct) of literacy underlying the telephone survey method is valid.

4. *Are the knowledge checklist scores from the telephone survey negatively correlated or not correlated with variables that the construct of literacy encompasses, such as relationships among literacy knowledge, age, and the amount of reading aloud to children?* In this case, it is anticipated that age is positively related to literacy knowledge, but that as age goes up, the amount of time spent reading to children decreases? In this case, there would be discriminant evidence for the theory of literacy underlying the telephone survey methodology.

5. *Can the information obtained by the telephone survey provide the same range of useful information that was obtained in the door-to-door National Adult Literacy Survey?* To answer this question, we conducted an analysis of the five informational products that the National Adult Literacy Survey was commissioned to produce to see how well the telephone data could be used to provide the same types of information. If the telephone data can provide the same range of useful informational products as the door-to-door surveys, then this provides evidence for action validity for both the effectiveness and the cost-effectiveness of the telephone survey methodology. The results of this action validity analysis are given in the Discussion section.

## Method

### *Participants*

Data for this study were derived from telephone interviews with 538 adults residing in households that could be reached by listed or unlisted telephone in the larger San Diego, California metropolitan area. This method of contacting participants included approximately 96% of all households. Sampling was conducted by using a random-digit dialing procedure designed to reach households without numbers listed in the telephone directory, because of unlisted numbers or newly listed numbers not yet printed, as well as households listed (Dillman, 1978, pp. 232–281; Frey, 1989, pp. 79–116). Participants who agreed to participate further and were willing to provide their name and address were mailed a written questionnaire to investigate their performance on the survey using another modality for responding.

In the telephone interview, the participants' mean length of residence in San Diego was 20.6 years ( $SD = 15.5$ ), mean educational level was 14.5 years ( $SD = 2.6$ ), mean age was 41.0 years ( $SD = 16.0$ ), mean total household income was \$34,340 ( $SD = \$12,240$ ), and mean number of persons in the household was 3.0 ( $SD = 1.8$ ).

*Similarity of the survey sample to us Census data.* The survey procedures yielded a sample that closely matched the 1990 US Census data, with some notable exceptions. Table 1 shows statistics for the telephone and mailed surveys and US Census population parameters for the San Diego region. Telephone and mailed samples of marital status, gender, age, and income were similar to census distributions. The telephone and mailed sample data were skewed upward in educational attainment, underrepresenting the lowest level of educational attainment and overrepresenting the highest level, in comparison to census data. Although moderate upward bias in the literacy parameters was present in the sample and more pronounced in the subsample, we do not believe that this undermines the main argument of the study. First, all English-speaking groups were represented, especially in the telephone survey. Second, the thrust of our argument was based on correlational analyses. The kinds of sample biases present would reduce, not increase, variance. This attenuates the correlations, making the findings overly conservative and working against our argument. Third, our findings are consistent with the National Adult Literacy Survey.

### *Procedures*

*Telephone interviews.* Interviews were conducted by university students trained for telephone interviewing for the project during the late spring and early summer of 1994. Participants were called between 4:30PM and 9:30PM weekdays and between 9:00AM and 9:30PM on weekends. Interviewers introduced the survey to the person who answered the telephone, gained informed consent, and asked to speak to the adult (18 years of age or older) who had "the most recent birthday" as a random method of selection among adults in the household. No substitutions were allowed so interviewers frequently were required to call the household back in order to complete an interview with the appropriate respondent. Up to four callbacks were made to households, and a response rate of approximately 50% was attained. Because of resource constraints, interviews were conducted only in English, a procedure that eliminated approximately 4% of respondents.

The telephone interviews provided an oral presentation of information, requiring the participants to listen and to respond to what they heard. Interviewers followed a protocol containing 63 questions, some with multiple items. About half of the questions concerned the assessment of literacy. These questions were interspersed among other questions that were part of another on-going research project conducted in the area of political behavior. The interviews required a mean of 27.7 minutes ( $SD = 7.6$ ) to complete.

TABLE 1. Comparison of the San Diego Telephone and Mailed Sample with the 1990 US Census Figures for San Diego County

<i>Variables</i>	<i>San Diego survey sample</i>		
	<i>Telephone</i>	<i>Mail-out</i>	<i>US census</i>
Marital status	(519)	(137)	
Single	30.4	24.8	30.2
Married	52.0	54.7	51.8
Separated/other	2.0	1.6	2.5
Widowed	6.2	8.0	5.6
Divorced	9.4	10.9	10.0
Household income	(478)	(131)	
Under \$10,000	9.0	6.1	6.8
\$10,000–\$49,999	59.6	59.5	56.5
Over \$50,000	31.4	34.4	36.7
Age	(512)	(137)	
18–24	15.4	12.4	17.8
25–34	23.6	21.2	26.4
35–44	27.7	26.3	20.1
45–59	17.8	23.4	16.4
60–64	3.3	2.2	4.7
65+	12.1	14.6	14.4
Education <sup>a</sup>	(517)	(135)	
0–11/Not HS	4.8	2.2	18.1
12/Comp. HS	20.7	20.7	22.8
13–15/Some coll.	35.4	33.3	25.6
16/AA or BA	18.0	17.0	24.7
17+/More	21.1	26.7	8.8
Race/Ethnicity	(520)	(137)	
White	72.9	82.5	65.6
Black	4.6	3.6	6.0
Asian	5.4	5.1	7.5
Other	3.5	1.5	0.0
Hispanic – all	13.7	7.3	20.0
Gender	(522)	(138)	
Male	47.9	44.2	50.9
Female	52.1	55.8	49.1

*Note.* Numbers are percentages of the samples and 1990 US Census with the characteristics listed.

<sup>a</sup>Education categories are codified differently for sample and census data as indicated by labels, with sample data matched as closely as possible to census categories. Labels for sample data precede labels for census data for education. Numbers in parentheses are total numbers for samples for a given characteristic.

*Mailed survey.* At the end of the telephone interview, the participants were told, "My office may wish to contact people who have helped us in this project to ask a few more questions by mail. May I include you on this list?" Participants who responded affirmatively ( $n = 280$ ) were mailed a questionnaire consisting of paper and pencil versions of the four literacy assessment checklists, a 26-item cloze test developed by Mikulecky and Diehl (1980, p. 78) and previously used to assess the general literacy skills of employees in 100 occupations, with a scale for converting cloze raw scores to reading grade levels and several items calling for demographic information. Questionnaires were sent under the university letterhead of one of the authors with a letter reintroducing the project and requesting that each participant "take a few minutes" to fill out the questionnaire and return it to the research office in the enclosed, addressed, postpaid envelope. Two waves of mailing were used, the first occurring 7 to 14 days following the initial telephone interview, and a follow-up mailing to those who had not responded within 21 to 28 days. About 50% of the participants ( $n = 140$ ) returned usable questionnaires.

### *Instrumentation*

As noted, the telephone survey involved questions that were not relevant to this study. Relevant questions were demographic in nature, including years of education, age, ethnicity, gender, English and other language use, occupation, and income. The Appendix presents a list of additional questions that provide information similar to various categories of information obtained in the National Adult Literacy Survey.

*Literacy knowledge checklists.* For the sake of time, four abbreviated versions of the checklists used by West et al. (1993) were used in the telephone survey. The Appendix presents the correct items and foils used in the Author Recognition Test (ART, Q26), the Magazine Recognition Test (MRT, Q27), the Cultural Literacy Test (CLT, Q31), and the Vocabulary Literacy Test (VLT, Q36).

For each checklist, the score for an individual was the proportion of correctly identified real names or words minus the proportion of foils incorrectly identified as real names or words. For instance, if a person said "yes" to 10 of the 17 names of famous people on the CLT and to 2 of the 6 foils, the person's score for the CLT was 25.5 (10/17 minus 2/6, or 58.8 minus 33.3). The correction for guessing prevented the participants from simply responding yes to all items. Rationales for the scoring procedures are given in West et al. (1993). The Appendix shows the participants' aggregated scores, corrected for guessing, for each item on the four checklists, along with corresponding data from West et al. (1993) for those designated as "readers" and "nonreaders." (There were no scores provided for the vocabulary checklist in West et al., 1993.)

Split-half, internal consistency (Spearman-Brown) reliabilities of the checklists ranged from .80 (MRT) to .88 (CLT). To increase the reliability of the

checklists as measures of the knowledge component of literacy, a total score was calculated, composed of the full number of 50 actual and 24 foil names and words. The internal consistency reliability for Total Literacy was .91. Table 2 presents test-retest (alternate modality or stability) reliabilities for the total score ( $r = .80$ ) and each of the checklists, ART ( $r = .71$ ), MRT ( $r = .67$ ), CLT ( $r = .73$ ), and VLT ( $r = .63$ ), obtained under the telephone (listening) and mailed survey (reading) conditions for 140 participants. Thus, strong evidence of reliability, both in terms of internal consistency and test-retest, was present for each of the four scales and the Total Literacy scale.

*Engagement in literacy practices and print exposure.* Participants were asked the number of times in an average week they engaged in various literacy practices such as reading for pleasure newspapers, books, and newsmagazines or reading job-related materials for work (Q7 & Q25). Question 25 also asked for how many times each week the person read to a child or listened to someone read aloud. This question is related to the interest in the intergenerational transfer of literacy, but in this case, the interest was in the transfer of literacy from the participants to their children.

*Self-report indicators of literacy competence.* Two questions asked the participants to rate their skills in reading in general (Q28) and reading to meet the requirements of their jobs (Q40). Self-perceptions of skills were also obtained in questions that asked participants whether they thought they could get a better job if they received additional training in reading and writing English (Q45) or in mathematics (Q46). Ratings of the participants' competence in understanding what they read at work were obtained (Q30a-e). Additionally, indirect self-reported indicators of literacy skills were obtained in a series of questions about the extent to which the participants received help from family or friends in reading or writing various materials (Q33a-e).

TABLE 2. Correlations of Checklist Literacy Scores on the Telephone (Listening) Survey with Scores on the Mailed (Reading) Survey

Listening	Reading					
	1	2	3	4	5	6
1. Total Literacy	<b>.80</b>	.71	.64	.74	.62	.38
2. Author Recognition Test	.67	<b>.71</b>	.50	.60	.43	.29
3. Magazine Recognition Test	.63	.51	<b>.67</b>	.57	.39	.31
4. Cultural Literacy Test	.71	.59	.55	<b>.73</b>	.53	.36
5. Vocabulary Literacy Test	.59	.51	.35	.51	<b>.63</b>	.30
6. Cloze	.39	.34	.41	.34	.31	1.00

Note. Total Literacy = scores summed over the four checklists. Boldface indicates alternate modality, test-retest reliability coefficients. Ns ranged from 135-137 except for the cloze test where Ns ranged from 108-109. All significant beyond  $p < .01$ .

*Intergenerational relations.* Two sets of questions provided information about participants' childhood home influences on their present literacy, such as their literacy environments when they were in high school (e.g., Q34c, When in high school did you have more than 25 books in the home?) and whether they had the same literacy resources in their homes as at the time of the interviews. Information regarding the participants' fathers' (Q53) and mothers' (Q54) years of education permitted the determination of the intergenerational relationships among parents' education levels and the subsequent education and literacy achievement of their adult children.

## Results

The results of the mailed survey in comparison to the telephone survey are presented first, to confirm the relations among listening (telephone) and reading (mailed).

### *Listening and Reading*

Among those 140 who returned the mailed questionnaire, participants were slightly better educated than the full telephone sample ( $M = 15.01, SD = 2.39$  versus  $M = 14.53, SD = 2.62$  for total telephone sample). Participants responding to the written, mailed survey scored somewhat higher (mean percent correct for Total Literacy = 61,  $SD = 23$ ) than they did on the telephone survey (mean percent correct for Total Literacy = 57,  $SD = 22$ ).

Table 2 presents the correlations among the literacy knowledge checklists when completed by the same 140 participants by listening in the telephone interview and some 2 to 3 weeks later by reading the mailed survey. The boldface coefficients are the alternate modality, test-retest reliability scores resulting from correlating checklist scores obtained by listening to the telephone interview with the scores on the same items obtained by reading the mailed survey. These positive correlations indicate that adults who scored low, medium, or high on the checklists when listening in the telephone interview tended to maintain their relative rank orders 2 to 3 weeks later when they completed the checklists by reading on the mailed survey.

Table 2 presents validity coefficients as correlations of the checklist scores obtained by listening and by reading with the scores on the alternative modality (cloze test) included in the mailed survey. All the correlations among checklist and cloze scores were positive and statistically significant ( $p < .05$ ). The predictive validity coefficients for checklist knowledge and cloze scores, resulting from correlating checklist scores obtained by listening 2 to 3 weeks before completing the cloze test on the mailed survey, were only slightly lower than the concurrent

validity coefficients obtained with the cloze tests and the written checklists when completed together on the mailed survey.

*Telephone Survey Results*

Table 3 presents the correlations among key demographic variables, the four checklists, and a “practice” variable (e.g., How often during an average week do you read a local or national newspaper?) computed as the average of questions 25a through 25k (see Appendix). The practice variable is a composite indicator of exposure to print and relates average frequency of weekly reading of different materials for various purposes to education, age, and the knowledge checklists.

Data from the telephone survey are presented above the diagonal, whereas for comparison purposes, data from West et al. (1993) are presented below the diagonal. Overall, there is consistency between the findings of the telephone survey and the work of West et al. (1993). In both studies, education attainment is positively related to the amount of knowledge of authors, magazines, famous people, and vocabulary indicated by scores on the checklists.

Table 3 shows positive correlations among demographic and literacy variables consistently found in adult literacy assessments for more than 75 years

TABLE 3. Correlations Among Literacy and Demographic Variables

<i>Variables</i>	1	2	3	4	5	6	7	8	9	10	11
1. Education	1.00	.07*	.23	.31	.31	.36	.37	.34	.14	-.10**	.34
2. Age	.16	1.00	.25	.16	.25	.19	.27	.08*	.30	.05*	.04*
3. ART	.33	.16	1.00	.61	.61	.53	<b>.81</b>	.23	.27	.10**	.23
4. MRT	.33	.06	.34	1.00	.58	.54	<b>.82</b>	.22	.30	.05*	.23
5. CLT	.48	.21	.43	.60	1.00	.62	<b>.84</b>	.23	.32	.05*	.18
6. VLT	.53	.26	.46	.48	.71	1.00	<b>.82</b>	.25	.29	-.04*	.26
7. Total literacy							1.00	.28	.36	.05*	.27
8. Practice								1.00	.09**	-.16	.26
9. Ethnicity <sup>a</sup>									1.00	.06*	.13
10. Gender <sup>b</sup>										1.00	-.13
11. Annual income											1.00

Note. ART = Author Recognition Test; MRT = Magazine Recognition Test; CLT = Cultural Literacy Test; VLT = Vocabulary Literacy Test. Total Literacy = scores summed over the four checklists; Practice = mean scores on questions 25a through 25k (see Appendix) for different reading practices. Correlations below the diagonal are from West et al. (1993) using versions of the checklists with more items. Boldface indicates part-whole correlations.

<sup>a</sup>Ethnicity = non-Whites (0) and Whites (1).

<sup>b</sup>Gender = males (1) and females (2).

\*Not significant.

\*\* $p < .05$ , all others significant beyond  $p < .01$ .

(Sticht & Armstrong, 1994). Generally, better educated participants scored higher than less well-educated participants; those with better educated parents scored better than those with less well-educated parents; the majority group (Whites) scored better than minorities (Hispanics, Blacks, Asians, others); managers and professionals performed better than clerical and sales persons, who, in turn, performed better than unskilled workers and laborers; those who earned more scored higher than those who earned less; and those who spent more time per week reading scored higher than those who read less.

### *Engagement in Literacy Practices and Print Exposure*

The Appendix presents mean scores and standard deviations related to the respondent's estimates of the frequency they engaged in various literacy practices during a typical week. Overall, participants reported reading a newspaper an average 4.4 times a week ( $SD = 2.8$ ,  $Q7$  &  $Q25g$ ). Reading for pleasure ( $Q25a$ ) was the most frequent reading practice ( $M = 4.68$ ,  $SD = 2.50$ ), whereas listening to someone read aloud was the literacy practice least frequently engaged in weekly ( $M = 0.52$ ,  $SD = 0.74$ ).

The trends for practice followed those for Total Literacy and were statistically significant ( $p < .05$ ). As educational attainment ( $r = .34$ ), age ( $r = .08$ ), occupational status ( $r = .17$ ), income ( $r = .26$ ), and father's education ( $r = .08$ ) increased, the average frequency of weekly literacy practices increased (though the correlation of father's education and literacy practice was not statistically significant). Whites were slightly more likely to engage in literacy practices than non-Whites ( $r = .09$ ).

Questions 5a and 6 in the Appendix present the mean hours per day the participants reported either watching television or listening to the radio. There was a significant, negative ( $r = -.14$ ,  $p < .001$ ) relation between the number of hours of television watched and the average weekly literacy practice score. No relation between radio listening and literacy practices was found. Neither television viewing nor radio listening was related to any of the literacy knowledge checklist scores.

### *Factor Analysis of Practice Items*

To better understand relations between literacy practices and demographic and literacy knowledge variables, the practice items ( $Q25a-Q25k$ ) were subjected to a principal components factor analysis and loadings rotated to simple structure by varimax criteria. Table 4 lists the factor loadings greater than .30. The four factors extracted account for over 62% of the total variance.

Practice 1 (news) groups the questions dealing with newspaper and magazine reading. Practice 2 (job) groups the reading at work items. Practice 3

TABLE 4. Component Loadings for Practice Items<sup>a</sup> After Varimax Rotation

	<i>Practice factors</i>			
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
<i>Times per week</i>	<i>News</i>	<i>Job</i>	<i>Pleasure</i>	<i>Family</i>
Q25G. Read local or national news	.84	-	-	-
Q25I. Read editorial section	.79	-	-	-
Q25H. Read sports section	.74	-	-	-
Q25F. Read newsmagazines	.43	-	-	-
Q25K. Read books or manuals on job	-	.88	-	-
Q25B. Read because job requires it	-	.86	-	-
Q25E. Read letters	-	.31	-	-
Q25D. Read a book for pleasure	-	-	.88	-
Q25A. Read for pleasure	-	-	.86	-
Q25J. Listen to others read	-	-	-	.79
Q25C. Read a book to a child	-	-	-	.79

Note. Dashes represent component loadings lower than .30. *n* = 538.

<sup>a</sup>Questions 25a–25k in Appendix.

(pleasure) groups items pertaining to reading books and other materials for pleasure. Practice 4 (family) groups items suggesting literacy practices for parenting or social communication around the home.

The correlations in Table 5 show relations between literacy practices and various demographic variables to establish construct or interpretive validity. For instance, literacy practice 4 (family) shared a statistically significant relation to age ( $p < .05$ ), suggesting that elderly adults read to or listened to children read less than younger adults; to gender, suggesting that females were more likely to read to others than males; to Latino status, suggesting that Latino participants were less likely to engage in the types of reading in practice 4 than non-Latino participants; and to Total Literacy, the ART, and the VLT, suggesting that reading to or listening to children or others read aloud does not contribute much to the growth of knowledge or vocabulary as measured in the checklists. In all cases, however, practice 4 (family) correlations were low and did not appear to account for much variance in the variables examined.

Interestingly, literacy practice 3 (pleasure), or reading books or other things for pleasure, was consistently most highly correlated with the literacy knowledge checklists. Literacy practice 2 (job), reading on the job, was the only factor significantly related to both father’s and mother’s education. Literacy practices 1 (news) and 3 (pleasure), reading newspapers, magazines, and books for pleasure, were positively related to age, whereas reading for work and for parenting were negatively related to age. This suggests that older people read

more for pleasure and information, whereas younger people read more for work and parenting. Women were less likely to read as much as men in the newspaper sections asked about in literacy practice 1 (news) or the types of materials asked about on the job (practice 2).

### *Self-Report Indicators of Literacy Competence*

Questions concerning self-reports of literacy competence showed a positive manifold of significant correlations with literacy checklist scores in the expected directions. For instance, as Total Literacy scores increased, participants were more likely to say that they understood nearly all or all of what they read (Q28 in the Appendix,  $r = .35, p \leq .001$ ), that their reading skills were adequate or more than adequate for their job (Q40,  $r = .34, p \leq .001$ ), that reading or writing training

TABLE 5. Correlations Among Demographic, Literacy Knowledge, and the Four Literacy Practice Factors of Table 6

<i>Variables</i>	<i>Practice factors</i>			
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
	<i>News</i>	<i>Job</i>	<i>Pleasure</i>	<i>Family</i>
Education	.17	.32	.22	.02*
Age	.26	-.19	.15	-.19
Gender <sup>a</sup>	-.23	-.18	.11	.13
Ethnicity <sup>b</sup>	.08*	-.01*	.15	-.08*
Income	.19	.18	.08*	.05*
Father's education	-.09	.20	.06*	.03*
Mother's education	-.03*	.13	.06*	.06*
Latino <sup>c</sup>	.08*	.04*	.08*	-.10
Total Literacy	.17	.12	.30	-.13
ART	.12	.09	.28	-.13
MRT	.10	.10	.24	-.07*
CLT	.15	.07*	.25	-.08*
VLT	.14	.17	.25	-.17

*Note.* Total Literacy = scores summed over the four checklists; ART = Author Recognition Test; MRT = Magazine Recognition Test; CLT = Cultural Literacy Test; VLT = Vocabulary Literacy Test.

<sup>a</sup>Gender = male (1) and female (2).

<sup>b</sup>Ethnicity = non-Whites (0) and Whites (1).

<sup>c</sup>Latino = Are you of Mexican, Hispanic, or Latino descent? Yes (1) or No (2).

\*Not significant at  $p < .05$ .

in English would not help them get a better job (Q45,  $r = .26, p \leq .001$ ), and that additional training in mathematics would not help them get a better job (Q46,  $r = .21, p \leq .001$ ). Similar, though somewhat lower significant correlations were found with each of the four separate checklists. Those who engaged in more literacy practices (Q25a–Q25k) rated themselves able to understand more of what they read (Q28,  $r = .27, p \leq .001$ ).

The frequency of responses to these rating scales (Q28) indicated that 6.7% of participants thought they sometimes had trouble understanding what they read, but 4% thought that their reading skills were either “not at all adequate” or “not as good as they should be” to do their job (Q40).

Consistent with these positive self-perceptions of reading skills, participants estimated how often they received help from family members or friends in accomplishing a variety of literacy practices (Q33), and most reported that they never had any help. However, when dealing with government, business, medical, or other agencies or personnel, about 15% of the participants reported receiving help on a monthly basis from friends or relatives. Less than 2% reported receiving help on one or another literacy practice on a daily basis.

Despite these generally optimistic ratings of reading ability, there were indications that many participants may have had a low sense of efficacy about their reading ability. Over 10% disagreed or strongly disagreed that they could read well enough to do their jobs well even when there were distractions (Q30d), and almost 1 in 10 (9.4%) disagreed or strongly disagreed that they could read well enough to do their job when under pressure to meet a deadline (Q30e).

Many participants placed a high value on being able to read better than they did. One in six (14.4%) thought they would get more respect at work if they understood what they read better (Q30a). One in five (19.4%) thought they would be able to do a better job if they could read better (Q30b), and one in eight (13.1%) thought they could earn more money if they could read better (Q30c).

### *Intergenerational Relations*

Father’s education was positively and significantly related to Total Literacy ( $r = .10, p \leq .03$ ), MRT ( $r = .14, p \leq .002$ ), VLT ( $r = .11, p \leq .014$ ), and literacy practice 3 (reading on the job,  $r = .20, p \leq .001$ ). Mother’s education was positively and significantly related only to MRT ( $r = .18, p \leq .002$ ) and literacy practice 3 (reading on the job,  $r = .13, p \leq .002$ ).

### *Establishing Literacy Levels*

Both the Armed Services and the National Adult Literacy Survey cast distributions of scores on literacy assessments into five levels of proficiency to identify groups, ranging from low to high (Sticht & Armstrong, 1994). Similarly, to illus-

trate the feasibility of that widely used approach in the present case, the results of the telephone survey were cast into five levels of proficiency using Total Literacy scores. The five levels were obtained using the mean (45) and standard deviation (25) of the percent correct scores for the Total Literacy distribution. Literacy levels were defined from low to high proficiency: level 1 = scores at  $-1.0 SD$  or lower (0–20), level 2 = scores between  $-.5$  and  $-1.0 SD$  (21–32), level 3 = scores between  $-.5$  and  $+.5 SD$  (33–58), level 4 = scores between  $+.5$  and  $+1.0 SD$  (59–70), and level 5 = scores from  $+1.0 SD$  and above (71–100).

Table 6 presents the percentage of the telephone sample represented in each of the five literacy levels for the full sample as well as for groups within several demographic variables. The demographic data indicate that the less well-educated, the young, non-Whites, and workers in less skilled occupations were overrepresented in level 1, compared to the total distribution of scores in the five categories. More females than males were represented in the higher levels of literacy.

For comparison purposes, data are presented showing the percentage of cases under the portions of the normal curve that were used to define the five literacy levels, the percentage of cases falling within each of the Armed Service's five categories for the Armed Forces Qualification Test based on the 1980 renorming of the Armed Services Vocational Aptitude Battery (Eitelberg, 1988), and the percentage of cases falling within each of the five literacy levels defined by the National Adult Literacy Survey (Kirsch et al., 1993). It should be noted that the Armed Services label their five levels from 5 as the lowest to 1 as the highest proficiency. Here we have reversed the numbers to be consistent with the present survey and the National Adult Literacy Survey. Also, to represent the National Adult Literacy Survey, we used the median percentage for each level for the three scales of prose, document, and quantitative literacy.

Given the differences in materials, tasks, contexts, samples, and procedures for scoring and grouping adults, there is little reason to expect any great similarities among the telephone survey, the Armed Forces Qualification Test and the National Adult Literacy Survey in terms of the percentages of cases that fall into each of the five levels. Table 6 confirms that there is little similarity among the samples assessed, a point for discussion later on.

## Discussion

The present research was motivated by interest increasingly shown by government agencies to find more cost-effective ways to assess adult literacy proficiency than the use of expensive door-to-door surveying and testing procedures (Neice et al., 1992; Reder, 1994b). Therefore, we set out to answer a fairly simple and straightforward question. Can we assess adult literacy proficiency by telephone? Based on the results of the study, we believe the answer is yes.

TABLE 6. Percentage of Telephone Survey Subjects Falling into Each of Five Levels of Literacy on the Total Literacy Scale

<i>Variables</i>	<i>N</i>	<i>Literacy levels</i>				
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
Total	538	19.2	14.1	31.4	16.7	18.6
Normal curve		16.0	15.0	38.0	15.0	16.0
AFQT categories		7.0	24.0	32.0	33.0	4.0
NALS levels		22.0	27.0	31.0	17.0	3.0
Education						
0-8	6	33.3	16.7	16.7	0.0	33.3
9-12	126	31.0	30.2	21.4	11.9	5.6
13-14	146	22.6	22.6	21.9	18.5	14.4
15-16	130	13.1	13.1	25.4	26.9	21.5
17+	109	9.2	11.0	12.8	23.9	43.1
Age						
16-18	14	35.7	42.9	21.4	0.0	0.0
19-24	65	41.5	23.1	16.9	13.8	4.6
25-39	198	21.7	21.2	23.2	21.7	12.1
40-54	141	9.9	13.5	15.6	24.1	36.9
55-64	32	6.3	12.5	28.1	18.8	34.4
65+	62	17.7	19.4	22.6	21.0	19.4
Ethnicity						
White	379	11.9	17.4	22.4	23.2	25.1
Black	24	25.0	37.5	16.7	20.8	-
Hispanic	71	45.1	19.7	18.3	8.5	8.5
Asian	28	42.9	21.4	14.3	14.3	7.1
Other	18	33.3	38.9	5.6	11.1	11.1
Occupation						
Laborer	50	42.0	26.0	14.0	12.0	6.0
Semi/skill	103	21.4	22.3	25.2	20.4	10.7
Clerk/sales	97	21.6	23.7	18.6	16.5	19.6
Tech/engr	60	10.0	11.7	31.7	23.3	23.3
Mn/ex/prf	165	12.1	15.8	15.2	25.5	31.5
Gender						
Male	250	21.2	19.2	22.0	18.8	18.8
Female	272	18.8	19.5	19.1	21.3	21.3

*Note.* Literacy levels are based on the Total Literacy score (sum of the four checklists). Range of percent correct scores for each level are: Level 1 = 0-20, Level 2 = 21-32, Level 3 = 33-58, Level 4 = 59-70, and Level 5 = 71-100. Normal Curve = the percentage of cases under the same areas of the normal curve that were used to define the five literacy levels. AFQT = Armed Forces Qualification Test categories numbered from 1 (low) to 5 (high) instead of 5 (low) to 1 (high) as the services do. NALS = National Adult Literacy Survey.

*Interpretive (Construct) Validity*

At the outset of the study, we asked several questions that relate to the construct validity of the telephone and checklist methodology.

1. *Does an oral presentation of checklists by telephone, which requires listening ability, produce results consistent with a written presentation of the checklists, which requires reading ability?* Yes, data from Table 2 for the telephone and mailed surveys reveal positive relationships between listening and reading ( $r = .80$  for Total Literacy scores), supporting an affirmative answer to this question.

2. *Do the knowledge scores obtained using the checklist and telephone survey methodology correlate significantly with scores on another frequently used method for assessing reading ability?* Yes, as indicated in Table 2, both the listening and reading checklist scores were positively and significantly ( $p < .05$ ) related to the cloze test with its greatly differing task demands and limited content (only one passage was used). These data, along with the data for the first question, provide evidence for the construct or interpretive validity (Messick, 1989) of the theory of literacy that states that both listening and reading tap a common knowledge base and that the knowledge base is a component of, not a proxy for, literacy (reading, in this case).

3. *Do the knowledge checklist scores from the telephone survey show positive relationships with demographic variables, such as years of education, parents' years of education, amount of reading, and so forth, that have been found in other major assessments of adult literacy?* Yes, convergent evidence for interpretive validity was presented in Table 3, where a positive manifold of statistically reliable correlation coefficients was presented for the interrelations among the literacy knowledge checklists and other variables that are interpretable in relation to the development of literacy, such as education, practice in reading, and income.

4. *Are the knowledge checklist scores from the telephone survey negatively correlated or not correlated with variables that the construct of literacy encompasses, such as relationships among literacy knowledge, age, and the amount of reading aloud to children?* Yes, discriminant evidence for the validity of the telephone methodology for gathering information on literacy practices was presented in Table 4, where factor loadings group responses in a manner consistent with the types of questions asked. Additionally, discriminant validity is evidenced in Table 5, where checklist scores were negatively correlated with the practices involved in family literacy (e.g., reading to children), which reflects the larger proportion of older adults in the sample whose children are grown and gone, yet whose literacy practices in other areas have tended to make them more literate (knowledgeable).

This confirmatory evidence of construct validity for the checklist and telephone methodologies is encouraging given that this was the first study of its kind and no attempt was made to develop checklists or cloze tests that would provide greater differentiation among people.

*Action (Use) Validity*

5. *Can the information obtained by the telephone survey provide the same range of useful information that was obtained in the door-to-door National Adult Literacy Survey?* This was the question, posed in the introduction to this study, that addresses the action or use validity (Messick, 1989) of the telephone and checklist methodology. The answer to this question is given here in the context of the analysis of the cost-effectiveness of the telephone survey methodology in contrast to door-to-door sampling for producing the range of informational products desired by the US Congress when it commissioned the national survey.

Regarding the cost of telephone surveys, in addition to sponsoring the collection of academic skill achievement data by direct testing in the United States, the National Center for Education Statistics has an office for conducting telephone surveys. According to Dr. Kathryn Chandler of the National Center for Education Statistics, costs per interview by telephone are a fraction of the costs of conducting door-to-door interviews (K. Chandler, personal communication, 1994). Chandler estimated that a sample of 6,000 telephone interviews with adults might easily be achieved for less than \$1 million. This suggests that to interview a national representative sample of 13,600 adults, with an oversampling of Black and Hispanic households, as was done in the National Adult Literacy Survey (Kirsch et al., 1993, p. 5), the cost would be approximately \$2 million or less. This compares to the approximately \$10.85 million cost of obtaining the national sample for the National Adult Literacy Survey.

The concept of *cost-effectiveness* requires that both the *cost* and the *effectiveness* of alternative methods to achieve the same or very similar outcomes be considered. There is no question that the telephone survey methodology is a lower cost approach to interviewing than door-to-door canvassing. Many may question, however, whether the checklist and telephone methodology yields inferences that are as valid (useful) for characterizing the literacy of the adult population as those derived from the actual performance of literacy tasks, as in the National Adult Literacy Survey. Fortunately, the report of the design of the National Adult Literacy Survey provides a list of outcomes, uses, or “benefits” that the National Adult Literacy Survey was intended to provide (Campbell et al., 1992, pp. 2–3). This makes it possible to conduct an action or use validity analysis to determine if the same or comparable outcomes as were produced by the National Adult Literacy Survey can also be obtained by the telephone survey approach.

The following discussion first states the informational products that the National Adult Literacy Survey was intended to provide (Campbell et al., 1992). This is followed by a discussion of what the National Adult Literacy Survey and the telephone survey method provide for the informational product and its uses, if any, under consideration. The National Center for Education Statistics survey design report stated that the National Adult Literacy Survey would accomplish the following:

1. *Describe the levels of literacy demonstrated by the total adult population as well as by adults comprising various subgroups, including those targeted as "at risk."* The National Adult Literacy Survey developed three groups of tasks called prose, document, and quantitative literacy; administered the tasks to samples of adults; and used the tasks to scale both the adults' literacy proficiencies on each of the three scales and the difficulty levels of the tasks using item response theory. The difficulty level of each task was defined as the level of literacy needed to have "an 80% probability of correct response." (Kirsch et al., 1993, p. 71). Next, participants were assigned to one of five literacy levels based on their proficiency scores. Table 6 shows the percentage of the adult population (aged 16 years and older) that was placed in each of the five levels of literacy proficiency following the National Adult Literacy Survey procedures.

How well do these procedures characterize the literacy skills of adults? First, the rationale for the decision to scale the adults' literacy proficiency using a probability of 80% of being able to perform a given task (when the probability could have been set at 70%, 60%, or any other percentage) was not discussed (Kirsch et al., 1993). Changes in this percentage would clearly change the outcomes of the analyses. Second, the decision to assign people to five levels of literacy proficiency based on their being able to perform 80% of the average tasks at a given level means that any competence to perform at higher levels was not "credited" to the adults. For instance, people who scored on average in level 1 could also perform 50% of level 2 tasks, 25% of the level 3 tasks, 20% of the level 4, and 16.7% of the level 5 tasks. Given these findings, it is difficult to ascertain what the literacy levels of adults "really" are.

The telephone survey methodology also permits people to be assigned to levels, as indicated in Table 6. By using means and standard deviations to establish level boundaries, the decisions regarding what probability figures for task performance should be used are eliminated. Further, other available test information based on normal curve statistics, such as the Armed Services Vocational Aptitude Battery, various IQ tests, the Scholastic Achievement Tests, and others, becomes relevant to interpreting the telephone survey data.

2. *Characterize the demonstrated literacy skills in terms of demographic and personal background information.* Major demographic data collected by the National Adult Literacy Survey were also collected in the telephone survey. In both assessments, literacy proficiency was positively and consistently related to education, age, ethnicity, income, occupational status, father's and mother's education, and extent of engagement in literacy practices such as newspaper and magazine reading. These same relationships have been reported for the last 75 years in every major mass assessment of adult "intelligence," "aptitude," or "literacy" (Sticht & Armstrong, 1994). These types of demographic-practice data were obtained at much less cost by the telephone survey. Data for ethnic groups collected in numerous past surveys has been used for making important decisions to provide special funding for educational programs and opportunities for minority groups.

3. *Characterize the work force of the country with respect to demonstrated literacy skills and activities reported by individuals in various occupational categories.* The National Adult Literacy Survey and the telephone survey both characterize the literacy proficiencies and practices of adults in major occupational groups. Both surveys produce similar results: Laborers are not as proficient as clerical workers, who are not as proficient as managers and professionals. These findings have been consistently found in numerous adult literacy assessments since the introduction by the US Army of mass testing during World War I (Sticht & Armstrong, 1994). The telephone survey method collects occupational data much less expensively than the door-to-door survey method.

4. *Provide an increased understanding of the skills and knowledge associated with functioning in a technological society.* Probably the most important question that the National Adult Literacy Survey researchers were asked to report on was, "Are the literacy skills of America's adults adequate . . . to ensure individual opportunities for all adults, to increase worker productivity, or to strengthen America's competitiveness around the world?" (Kirsch et al., 1993, p. xviii). The National Adult Literacy Survey report answered the question as, "Because it is impossible to say precisely what literacy skills are essential for individuals to succeed in this or any other society, the results of the National Adult Literacy Survey provide no firm answers to such questions" (Kirsch et al., 1993, p. xviii). The authors discussed the relation of being in the lower literacy levels to one's social standing as indicated by more limited occupational opportunities, income, and so forth. From this, readers were invited to make inferences about how lower literacy skills may tend to limit one's functioning in society. But all of these same relationships are readily studied by the telephone survey methodology at a lower cost and with fewer decisions having little or no rationale presented.

It might even be argued that the assessment of knowledge (by checklists or other methods) is a more useful method for characterizing the "skills and knowledge associated with functioning in a technological society." Several studies have demonstrated that high levels of prior or background knowledge in a specific domain can compensate for several years of general reading skill (Recht & Leslie, 1988; Sticht et al., 1986). The National Adult Literacy Survey study itself concluded that high levels of prior or background knowledge about what one reads is prerequisite for comprehending at a high level across the wide range of tasks in the battery.

For these reasons, it seems likely that assessments of knowledge might better predict the performance of real-world literacy tasks than the National Adult Literacy Survey-type scales. The Armed Services have spent decades and tens of millions of dollars on the Armed Services Vocational Aptitude Battery, consisting of ten tests, all of which require some reading, and eight of which are tests primarily involving general and special vocabulary and conceptual knowledge (e.g., knowledge of geometry, electronics, automobiles, etc.; Sticht & Armstrong, 1994, pp. 31-39). These knowledge tests are used to select applicants for military service and to predict who will be most likely succeed in different kinds of technical training and jobs. This supports the position that knowledge assessment can

serve to identify those who can use printed and written materials to function in society, at least in the high-technology world of the armed services.

5. *Interpret the findings related to information-processing skills and strategies in a way that can inform curriculum decisions pertaining to the education and training of adults.* The developers of the National Adult Literacy Survey suggested that adult basic skills programs should be geared to improving adults' skills in prose, document, and quantitative (PDQ) literacy (Mosenthal & Kirsch, 1994). Indeed, researchers at the Educational Testing Service worked on an interactive video, computer-based instructional series that would teach document literacy skills. A small pilot study with a group of some 10 to 12 adult basic-skills students indicated that, although students made improvements in document literacy, they made three to four times as much gains on prose and quantitative literacy tests as on the document literacy tests. This finding led the instructor who administered the pilot course to observe that, "The gains were interesting considering the PDQ curriculum did not include instruction in these skills." (Orr-Holley, 1992, p.1).

This observation raises questions about the validity of the three scales as distinct scales. Others who have analyzed the National Adult Literacy Survey data have concluded that there are high intercorrelations among the three scales (approximately .90; Reder, 1994b), and the results of factor analysis (Salganik & Tal, 1989) suggest that the three scales are not providing any different, unique information. The results of the pilot instructional program would seem consistent with this point of view.

The present study adds support to Stanovich's (1993) socially relevant work on the origins of "verbal intelligence." The theory behind the knowledge-based approach to literacy assessment used in the telephone and checklist survey is the practice-engagement theory of literacy development (Krashen, 1993; Reder, 1994a; Stanovich, 1993). This theory holds that engaging in extensive and diverse reading builds substantial declarative and procedural knowledge and automaticity of word recognition that, in turn, make it possible to engage in and successfully complete literacy tasks. This view suggests one simple recommendation for curriculum development for adult literacy programs from the telephone and checklist methodology. To help people develop large bodies of knowledge and hence to become highly literate, literacy programs should arrange conditions that will encourage students to engage in extensive, wide-ranging reading over long periods of time.

### *Sampling and Other Issues*

The use of sampling techniques raises questions about how well the samples represent the adult population in general, and particular segments in particular. Some may question the validity of the inferences derived from the telephone methodology for accurately representing the literacy of adults because some adults do not have telephones, and they are likely to be the least educated, for

whom literacy is a major concern. For developing nations, this may mean that the telephone survey methodology is not appropriate. However, in industrialized nations, the telephone survey methodology may prove useful, though there will always be issues of sampling for representativeness. But sampling issues plague all surveys, and though we did not choose to do so in this demonstration study, demographic data from the census could be obtained to permit quite accurate extrapolations of literacy estimates to households without telephones and for the least educated. In fact, as noted earlier, the US National Center for Education Statistics already has an office that uses biennial telephone surveys to obtain information about adult education. The same sampling methods can be used to acquire a representative sample of adults for literacy assessment (K. Chandler, personal communication, 1994).

Interestingly, Reder (1995) produced National Adult Literacy Survey estimates for the San Diego region and reported that about 15% of adults fell into National Adult Literacy Survey level 1; 25% in level 2; and 60% in levels 3, 4, and 5 combined. These figures contrast with those of our telephone survey and are quite different from the data for the national sample used in the National Adult Literacy Survey (Table 6). Earlier, we noted that our San Diego sample was not comparable to the National Adult Literacy Survey sample, hence it is not surprising that Reder's (1995) estimation formulas, which were based on National Adult Literacy Survey data, present results at variance to our telephone data. The National Adult Literacy Survey sample was based on national census figures, whereas the San Diego sample was based on regional numbers. Additionally, the National Adult Literacy Survey included recent immigrants and longer term residents who did not speak English, whereas the present demonstration research did not. That is one reason why the National Adult Literacy Survey had so many people in level 1 (Table 6). Many of the non-English speaking adults were unable to perform most of the National Adult Literacy Survey tasks and were assigned scores through estimation techniques that placed them in level 1. This procedure could, of course, be carried out with telephone surveys. One would simply assign a score of zero to non-English speaking participants, and this would place them in level 1 of the telephone survey.

Another issue is possible resistance to the telephone and knowledge methodologies for assessing adult literacy, because there is no actual reading or writing involved. But this may change if further studies can refine the methodology and if reports can educate the profession and the public about the validity and cost-effectiveness of the methodology. There is some evidence that this telephone survey may be gaining popular acceptance (see Shanker, 1996).

### *Conclusion*

Motivated by the search to provide a more cost-effective methodology than door-to-door surveys for the large-scale assessment of adult literacy, this study provides evidence of interpretive (construct) and action (use) validity to

support the conclusion that the telephone and checklist survey methodology may provide a viable alternative to door-to-door literacy surveys such as the National Adult Literacy Survey. It has demonstrated construct validity with regard to the theory of the knowledge base that underlies the uses of the checklists by listening and reading, and it has produced evidence for convergent and discriminant validity indicated by relations of the telephone literacy scores with other variables that are interpretable by the construct of literacy as used here. Action validity was demonstrated by showing that the telephone and checklist methodology can produce all of the same five informational products that the door-to-door National Adult Literacy Survey was designed to provide at a fraction of the cost.

## Notes

Support for this research was provided by the William and Flora Hewlett Foundation; the Department of Political Science, San Diego State University; the Spencer Foundation; and the San Diego Consortium for Workforce Education and Lifelong Learning. The opinions expressed are solely those of the authors, and no official endorsement by their institutional affiliations should be inferred. We thank the adult survey respondents, the graduate student interviewers, and the anonymous reviewers for their helpful comments on an earlier version of this article.

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Manuscript received: October 25, 1995  
 First revision requested: January 25, 1996  
 Final revision received: April 17, 1996  
 Accepted for publication: May 15, 1996

## APPENDIX

Items from the telephone survey relevant to the assessment of adult literacy.

<i>Item</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Q5A. On an average day about how many hours do you watch television?	2.47	1.69	529
Q6. On an average day about how many hours do you listen to radio?	2.68	2.93	533
Q7. In an average week about how many times do you read a newspaper?	4.40	2.76	534
Q25. How often during an average week do you do each of the following:			
a. Read something for pleasure?	4.68	2.50	528
b. Read something because your job requires it?	3.37	2.80	524
c. Read a book to a child?	0.64	0.83	529
d. Read a book for pleasure?	3.10	2.78	527
e. Read letters?	0.91	0.73	527
f. Read a newsmagazine?	0.79	0.67	528
g. Read local or national news in a newspaper?	4.38	2.77	529
h. Read the sports section of a newspaper?	2.38	2.91	529
i. Read the editorial section of a newspaper?	2.69	2.85	529
j. Listen to someone else in your household read aloud?	0.52	0.74	529
k. Read books or manuals to help you do your job?	2.34	2.51	523

*Author Recognition Test (ART)*

Q26. I will now read you a list of names. Some of the people in this list are popular writers of books, magazines, and/or newspaper columns, and some are not. Please just tell me if you recognize each one as a writer. Please do not guess (10 real/5 foils). Data are percentage of subjects saying "yes" to each name. wsm = West, Stanovich, & Mitchell (1993, pp.35-50).

<i>Author</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Data from wsm</i>	
				<i>Reader</i>	<i>Nonreader</i>
a. Andrew Greeley	0.26	0.44	498	0.48	0.23
b. Irving Wallace	0.50	0.50	501	0.69	0.33
c. Nancy Roser (foil)	0.05	0.22	490	0.02	0.00
d. James Clavell	0.44	0.50	502	0.65	0.32
e. Isabel Beck (foil)	0.14	0.35	494	0.01	0.03
f. Louis L'Amour	0.64	0.48	515	0.69	0.43
g. Robert Tierney (foil)	0.20	0.40	491	0.02	0.03

h. Judith Krantz	0.58	0.49	509	0.77	0.48
i. P.E. Bryant (foil)	0.13	0.34	494	0.00	0.02
j. James Michener	0.66	0.47	516	0.90	0.65
k. Sidney Sheldon	0.82	0.39	517	0.88	0.75
l. Gerald Duffy (foil)	0.09	0.29	494	0.01	0.03
m. J.R.R. Tolkien	0.58	0.49	506	0.80	0.57
n. Joseph Wambaugh	0.49	0.50	512	0.63	0.29
o. Bob Woodward	0.43	0.50	502	0.73	0.36

*Magazine Recognition Test (MRT)*

Q27. I will now read you a list of magazine names. Some of the names are real magazines, and some are not. Please listen to the names and tell me if you recognize each as an actual magazine. Please do not guess (9 real/6 foils). wsm= West, Stanovich, & Mitchell (1993, pp. 35-50).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Data from wsm</i>	
				<i>Reader</i>	<i>Nonreader</i>
a. Harper's Magazine	0.73	0.45	517	0.77	0.52
b. Gentlemen's Quarterly	0.66	0.47	515	0.73	0.53
c. Fitness Today (foil)	0.46	0.50	489	0.26	0.36
d. American Journal Review (foil)	0.35	0.48	486	0.04	0.08
e. New Yorker	0.79	0.41	517	0.89	0.69
f. Trends American (foil)	0.10	0.31	478	0.00	0.02
g. Ladies Home Journal	0.81	0.39	516	0.92	0.79
h. Scientific American	0.53	0.50	505	0.61	0.43
i. Town & Country	0.75	0.43	508	0.72	0.54
j. Health & Life (foil)	0.22	0.42	483	0.09	0.15
k. Psychology Today	0.72	0.45	513	0.83	0.67
l. Outdoor Times (foil)	0.27	0.45	484	0.05	0.09
m. Esquire	0.90	0.31	520	0.98	0.83
n. Forbes	0.81	0.39	520	0.95	0.81
o. Motor Sports (foil)	0.24	0.43	481	0.08	0.12

Q28. Many people tell us that they have difficulties in understanding what they read. In general, would you say that you sometimes have trouble understanding what you read (1), you understand most of what you read (2), you understand nearly all you read (3), or you understand all you read (4)?

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Frequency (%)</i>			
				<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Average rating	2.95	0.88	522	6.7	21.5	41.8	30.1

Q29. How connected would you say reading ability is to how well you do your job at work? Not at all connected (1), not very connected (2), somewhat connected (3), very connected (4).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Frequency (%)</i>			
				<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Average rating	3.53	0.80	471	4.5	6.2	21.4	67.9

Q30. For each of the following statements, just tell me whether you agree strongly (1), agree (2), disagree (3), disagree strongly (4).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Frequency (%)</i>			
				<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
a. If I understood what I read better, I would get more respect where I work.	2.51	0.88	452	14.4	31.6	42.3	11.7
b. If I understood what I read better, I would be able to do better at the job.	2.36	0.91	454	19.4	35.7	34.4	10.6
c. If I understood what I read better, I would be able to earn more money.	2.50	0.83	457	13.1	32.4	45.7	8.8
d. I can understand what I read well enough to do my job well even when there is a lot of distraction.	1.82	0.61	467	29.1	60.4	10.1	0.4
e. I can understand what I read well enough to do my job well even when I am under a lot of pressure to meet a deadline.	1.80	0.60	468	29.5	61.1	9.2	0.2

*Cultural Literacy Test (CLT)*

Q31. I will now read you a list of names of persons. Some of the people in this list are popular famous persons, and some are not. Please listen to each name and tell me if you know the person to be famous. Do not guess (17 real/6 foils). WSM = West, Stanovich, & Mitchell (1993, pp. 35–50).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Data from WSM</i>	
				<i>Reader</i>	<i>Nonreader</i>
a. Ingmar Bergman	0.73	0.44	511	0.95	0.78
b. John Gottman (foil)	0.11	0.31	485	0.02	0.03
c. Steve Biko	0.12	0.32	485	0.46	0.23

d. Harry Houdini	0.90	0.30	514	0.93	0.75
e. Paul Cezanne	0.41	0.49	497	0.64	0.26
f. Marie Curie	0.71	0.45	509	0.88	0.65
g. Dale Blyth (foil)	0.05	0.23	479	0.02	0.01
h. Jean Jacques Rousseau	0.57	0.50	505	0.51	0.34
i. Enrico Fermi	0.30	0.46	493	0.55	0.26
j. Darwin Muir (foil)	0.15	0.35	483	0.01	0.00
k. Carlos Fuentes	0.33	0.47	493	0.31	0.15
l. George Gershwin	0.84	0.37	510	0.98	0.82
m. Reinhold Klieger (foil)	0.09	0.29	482	0.02	0.01
n. Rosa Parks	0.56	0.50	500	0.57	0.35
o. Margaret Mead	0.69	0.46	508	0.87	0.64
p. Miriam Sexton (foil)	0.12	0.32	482	0.02	0.02
q. Georgia O'Keefe	0.46	0.50	496	0.64	0.43
r. Sylvia Plath	0.25	0.44	488	0.39	0.13
s. Cole Porter	0.73	0.44	509	0.92	0.69
t. Walter Raleigh	0.65	0.48	505	0.76	0.54
u. W. Patrick Dickson (foil)	0.10	0.30	484	0.00	0.02
v. Margaret Sanger	0.37	0.48	493	0.43	0.22
w. Greta Garbo	0.90	0.30	516	1.00	0.88

Q33. In general, how frequently do family members or friends help you with the following activities? Never (0), annually (1), monthly (2), weekly (3), daily (4).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Frequency (%)</i>				
				<i>0</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
a. Filling out forms	0.58	0.91	517	64.4	19.9	10.3	4.4	1.0
b. Reading or explaining newspaper articles or other written information	0.52	0.95	521	72.0	11.9	8.8	6.7	0.6
c. Dealing with government agencies, public companies, business, medical personnel, etc.	0.70	0.94	514	56.6	23.3	15.0	3.9	1.2
d. Writing notes and letters	0.44	0.96	518	79.0	7.1	6.6	5.6	1.7
e. Helping you with things you need to read at work	0.29	0.77	479	85.0	6.1	5.2	2.7	1.0

*Vocabulary Literacy Test (VLT)*

Q36. I will now read you a list of vocabulary words. Some of the words in this list are real words, and some are not. Please listen to the words and tell me if you know the word to be real. Please do not guess (14 real/7 foils). WSM = West, Stanovich, & Mitchell (1993, pp. 35-50).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Data from WSM</i>	
				<i>Reader</i>	<i>Nonreader</i>
a. absolution	0.77	0.42	507	Not reported in WSM	
b. arrate (foil)	0.30	0.46	496		
c. nitrous	0.71	0.45	512		
d. audible	0.90	0.30	513		
e. ceiloplaty (foil)	0.06	0.24	476		
f. comectial (foil)	0.05	0.22	472		
g. confluence	0.53	0.50	494		
h. connote	0.53	0.50	498		
i. polarity	0.84	0.37	516		
j. disconcert	0.80	0.40	506		
k. ineffity (foil)	0.18	0.38	483		
l. nuance	0.74	0.44	510		
m. irksome	0.65	0.48	503		
n. ubiquitous	0.61	0.49	504		
o. metention (foil)	0.09	0.28	481		
p. neotatin (foil)	0.11	0.31	481		
q. purview	0.44	0.50	490		
r. nonquasity (foil)	0.13	0.33	481		
s. optimize	0.85	0.35	513		
t. eventuate	0.48	0.50	491		
u. epicurean	0.57	0.50	500		

Q40. In terms of what is required for your occupation, how would you rate your own reading skills? Not at all adequate (1), not as good as should be (2), adequate for job (3), more than adequate (4).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Frequency (%)</i>			
				<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Average rating	3.52	0.58	499	0.4	3.0	41.1	55.5

Q45. Do you think you could get a (better) job if you received additional training in reading or writing English? Yes (1),no (2).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Frequency (%)</i>	
				<i>1</i>	<i>2</i>
Average rating	1.67	0.47	483	33.3	66.7

Q46. Do you think you could get a (better) job if you received additional training in mathematics? Yes (1), no (2).

	<i>M</i>	<i>SD</i>	<i>n</i>	<i>Frequency (%)</i>	
				<i>1</i>	<i>2</i>
Average rating	1.62	0.49	484	37.8	62.2

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