Discrepancy Between Older Clients’ Ability To Read and Comprehend and the Reading Level of Written Educational Materials Used by Occupational Therapists

Janelle Griffin,
Kryss McKenna,
Leigh Tooth

OBJECTIVE. The match between the reading level of occupational therapy education materials and older clients' reading ability and comprehension was determined. The sociodemographic and literacy characteristics that influenced clients' reading ability and comprehension were investigated.

METHOD. The reading level of 110 written education materials (handouts, brochures, and information leaflets), distributed to older clients (65 years of age and older) by occupational therapists working in Queensland hospitals, was analyzed using the Flesch formula. The reading ability of 214 older persons (mean age 77 years, 63% female) was assessed using the Rapid Estimate of Adult Literacy in Medicine. Participants' comprehension of information of increasing reading difficulty was measured using the Cloze procedure.

RESULTS. The written materials required a mean reading level between the ninth and tenth grades. Participants' mean reading ability was seventh to eighth grade. Therefore some materials may have been too difficult for participants to read and understand. Participants with a managerial or professional or clerical background ($p = 0.001$) and those who perceived they read well ($p = 0.001$) had a significantly higher reading ability. Older age was significantly related to poorer comprehension ($p = 0.018$), with participants 75 years of age and over having a mean comprehension score of 25.6 compared to 30.3 for those 65 to 74 years of age.

CONCLUSION. Occupational therapists must analyze the reading level of the written education materials they develop for and use with clients by applying readability formulas. There should be a match between the reading level of written materials and clients' reading ability. Clients' reading ability may be assessed informally by discussing years of education and literacy habits or formally using reading assessments. Content and design characteristics should be considered when developing written education materials for clients.

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Occupational therapists are frequently involved with teaching clients skills and techniques to enable them to achieve independence and to manage their condition (Flinn & Radomski, 2002). Occupational therapists work with clients towards the achievement of their goals and seek to actively involve them in treatment (Trombly, 2002). Provision of education underpins this client-centered approach to therapy. Client education offers an opportunity for collaboration between practitioner and client. As well as knowledge acquisition, education enables clients to be involved in treatment decisions and in turn to follow a treatment course to which they are committed (Miller & Shank, 1986). Education facilitates adjustment to medical conditions and prepares clients for medical procedures (Hill, 1997). Education can reduce anxiety, enhance clients' feelings of confidence and control (Coulter, Entwistle, & Giblet, 1998), and improve practitioner–client relationships and client satisfaction with services (McKinnon, 2000).

The importance of client education in occupational therapy practice is reflected in the results of a survey of 147 Australian occupational therapists working with adults with physical disabilities (McEnany, McKenna, & Summerville, 2002). This survey found that client education was the most commonly used treatment medium, with 74% of therapists using it often or most of the time.

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Occupational therapists use a variety of media to educate clients. Clients have expressed a preference for a combination of verbal and written information (Wilson et al., 1993). Written materials are the most common instructional tools employed by health practitioners (Lorig, 2000). In a survey of 50 occupational therapists working in adult physical dysfunction settings across Queensland (Sharry, McKenna, & Tooth, 2002), 49 frequently used verbal and written educational strategies with their clients. Written materials offer message consistency, serving as an adjunct to verbal education. They allow flexibility in the timing and delivery of information, with clients able to refer to them when required and to use them to learn at their own pace.

For written information to be effective it must be written at a level that clients can read and understand. The reading level and comprehensibility of written materials are therefore important issues. The reading level of written materials, or how easy they are to read, can be assessed by readability formulas, which examine syntactic and semantic variables to provide an objective measure of the style of a written passage (Dollahite, Thompson, & McNew, 1996). The use of readability formulas has highlighted that the reading level of many health-related materials is above the mean reading ability of target client groups (Cooley et al., 1995; Davis et al., 1994; Sarma, Alpers, Prideaux, & Kroemer, 1995).

Comprehensibility, or the client's understanding of written materials, is commonly assessed using reading tests that score word recognition and pronunciation, and comprehension tests that assess understanding (Fisher, 1999). The ability to read words and the ability to understand what they mean are related, with older persons who are poor readers reporting difficulty understanding written health information (Weiss, Reed, & Kligman, 1995). However, discrepancies between reading ability and comprehension have been reported. For example, Miller and Bodie (1994) found that participants' comprehension scores were three grades lower than their word recognition scores when reading health information materials. For this reason, it is recommended that both reading ability and comprehension be measured when seeking to develop written materials that can be effectively used by a target audience.

Older persons (65 years of age and older) are one client group for whom occupational therapists provide education (Sharry et al., 2002). With worldwide demographic changes resulting in an increased proportion of older persons in the population, occupational therapists in all countries are likely to have increasing numbers of older persons as clients. Because older persons have a higher incidence of chronic diseases, they are often treated using a self-management approach, which incorporates education to enhance resourcefulness and feelings of control and self-efficacy (Lorig, 2000). Older persons have the lowest levels of functional literacy, defined as a reading and writing ability sufficient to manage daily activities (Harris & Hodges, 1995), when compared to any other age group. In the United States, 40% of persons 65 years of age and older are functionally illiterate compared to 10% of the general population (Davidhizar & Brownson, 1999). This is likely because they have had fewer years of education (Weiss et al., 1995) and experience age-related changes that can affect reading and comprehension abilities (Van der Linden et al., 1999). General literacy skills impact on health literacy, which refers to the ability to read, understand, apply, and therefore benefit from health information (Schwartzberg, 2002). Clients with low health literacy are more likely to report poor health, more likely to be hospitalized, and less likely to follow medical advice, discharge instructions, and prescription labels (Davidhizar & Brownson, 1999). Older persons with low health literacy skills could have difficulty reading and understanding the written education materials provided to them by occupational therapists.

Not all older persons have low health literacy skills. Older persons with specific sociodemographic and literacy characteristics may be more at risk of low health literacy. In addition to increasing age and fewer years of education, gender, ethnicity, socioeconomic status, literacy habits, and perceived reading ability have been associated with poor health literacy levels.

The association between gender and health literacy has been variously reported. Burggraf (2000) contended that older females, particularly those from diverse cultural backgrounds, often have the poorest reading ability because access to educational opportunities during their childhood may have been reduced for historical or sociocultural reasons. In contrast, Weiss et al. (1995) found that males were more likely to report difficulties understanding information provided to them by medical personnel. In the United States, the proportion of the population with low literacy skills is higher among minority and low-income groups (Davidhizar & Brownson, 1999). Literacy habits, often measured according to the regularity with which reading is undertaken and information is sought, may impact on literacy skills, with atrophy of literacy skills occurring when reading is not frequently undertaken (Wickert, 1989). Perceived reading ability has been found to mirror actual reading skill, particularly when reading skills are poor. In an Australian survey, 28% of 9,302 participants who rated their reading skills as excellent were assessed as having good or very good literacy skills. This compared to 92% who rated their reading skills as poor actually having poor skills (Australian Bureau of Statistics, 1996).

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All health practitioners, including occupational therapists, need to become better client educators by understanding their clients' literacy skills and identifying techniques that enable improved communication of information. This can be achieved in two ways. First, the literacy skills of the target client group should be understood to enable educational materials to be tailored to their needs. Second, particular subgroups of clients at risk of poor health literacy should be identified so that additional learning support can be provided to them.

The purpose of this study was to measure the literacy skills (reading and comprehension ability) of older clients and to determine whether written materials currently used to educate older clients were matched to these skills. Sociodemographic and literacy characteristics identified as potentially affecting reading and comprehension ability were measured to determine if particular subgroups of older clients were at risk of poor health literacy. The specific aims of this study were to (1) analyze the reading level of written education materials that occupational therapists give to older clients; (2) identify the reading and comprehension ability of older clients; (3) compare the reading levels of materials to the reading ability of older clients; and (4) determine whether particular sociodemographic and literacy characteristics affected older clients' reading and comprehension ability.

Method

This study comprised two phases: analysis of the reading level of written education materials that occupational therapists give to older persons; and assessment of a sample of older participants to determine their reading and comprehension abilities.

Analysis of the Reading Level of Written Education Materials

A total of 16 public hospitals in the State of Queensland, Australia, were identified as having occupational therapists on staff (OT Australia, Queensland, 1999). Letters were sent to the senior occupational therapist requesting that all written education materials (handouts, brochures, and information leaflets) distributed to older clients (65 years and older) be forwarded to the researcher.

The Flesch Reading Ease (Flesch, 1948) formula was used to analyze the reading level of the written education materials. The Flesch formula has been found to be valid for use in assessing adult educational materials (Pichert & Elam, 1985). Correlations ranging from 0.79 to 0.96 have been found between the Flesch formula and the Gunning FOG Index, Fry Readability Test and SMOG and Dale-Chall formulas (Ley & Florio, 1996). In three samples of text of 100 words each in each of the materials, the average number of syllables and the average number of words per sentence were entered into the following formula (RE = 206.835 – 1.015S – 0.846W where RE = reading ease, S = average sentence length, and W = average word length). Reading ease scores were converted to a school grade equivalent (from fifth grade- to college graduate-level) to determine the reading levels of materials.

Analysis of Reading and Comprehension Skills

Participants. A convenience sample of participants was recruited from one metropolitan hospital in Queensland, Australia, between May 1999 and April 2000. Participants were inpatients admitted to the hospital's rehabilitation unit who were 65 years of age or older and spoke and read English well enough to participate in the interview and reading tasks. Potential participants were excluded if they had a cognitive impairment or an uncorrected visual or auditory impairment that might interfere with evaluation of their reading and comprehension skills.

Data Collection

Reading Ability. Participants' reading ability was assessed using the Rapid Estimate of Adult Literacy in Medicine (REALM), a reading recognition test that measures the ability to pronounce 66 medical words (Murphy, Davis, Long, Jackson, & Decker, 1993). Words are presented in order from one and two syllable words (stress, kidney) to four and five syllable words (emergency, antibiotics). Raw scores are converted into four grade-range estimates of literacy: less than or equivalent to third grade, fourth to sixth grade, seventh to eighth grade, and greater or equivalent to ninth grade. The REALM's criterion validity was established through correlations with the raw scores of three already standardized reading tests: the Wide Range Achievement Test—Revised (r = 0.88), the Slosson Oral Reading Test—Revised (r = 0.96), and the Peabody Individual Achievement Test (r = 0.97) (Davis et al., 1993; Murphy et al.). The REALM has a reported test–retest reliability of 0.99 (n = 100) and interrater reliability of 0.99 (n = 20) (Davis et al., 1993). This test was chosen because it is quick and simple to administer and score, and has been widely used in previous research.

Comprehension Ability. Participants' comprehension ability was assessed using the Cloze procedure (Taylor, 1953), in which every fifth to seventh word of a sample of text of approximately 250 words is omitted. The Cloze has been used to assess written health information (Holcomb & Ellis, 1978) and is a recommended adjunct to reading assessments (Ley & Florio, 1996). It was chosen as the measure of comprehension because it provided a simple way of assessing whether participants understood the context of
the information and avoided the need to develop and validate knowledge tests, which is the other accepted way of assessing comprehension. The percentage of words correctly inserted is interpreted as follows: 56% or above indicates that the reader can understand the content without assistance, scores between 44% and 55% suggest that the reader can understand the material with supplemental instruction, and a score below 44% indicates that the material is too difficult for the reader to understand. Exact word matches and synonyms were scored as correct.

Cloze procedures were administered on samples of text from three of the materials, of increasing reading difficulty, that were analyzed in this study. The first sample, categorized as “easy” to read with a seventh-grade reading level according to the Flesch, was from the brochure “Strategies for Preparing to Cease Smoking” (undated brochure produced by occupational therapists at The Prince Charles Hospital, Brisbane, Queensland, Australia) with 41 words omitted. The second was a sample of text of “moderate” reading difficulty (eighth- to ninth-grade reading level on the Flesch) from “Acute versus Chronic Pain” (undated brochure produced by occupational therapists at the Mater Hospital, Brisbane, Queensland, Australia) with 42 words omitted. The third sample, considered “hard” to read with a college reading level, was from the brochure “Sleep and Relaxation” (undated brochure produced by occupational therapists at the Princess Alexandra Hospital, Brisbane, Queensland, Australia) with 39 words omitted.

**Sociodemographic and Literacy Characteristics.** Information on participants’ sociodemographic and literacy characteristics was collected to determine their effect on participants’ reading and comprehension ability (see Table 1). These characteristics included age, gender, years of education, socioeconomic status (measured according to previous main occupation), ethnicity (measured as whether English was the primary language), literacy habits (measured as [1] the number of newspapers, magazines, books, journals, and brochures read per week and [2] how often written health information was sought), and perception of reading ability.

**Procedure.** Ethical approval was obtained from university and hospital committees and participants consented to their involvement in the study. After collecting background information from participants by interview, the REALM was administered. Although all participants were invited to complete the three Cloze procedures, only those with the time or who were comfortable with the process completed them in order from easy to hard.

**Statistical Analysis**

Descriptive statistics, analyzed using the Statistical Package for Social Sciences (version 11), were used to report reading statistics for the written materials, participant sociodemographic and literacy characteristics, and the results of participants’ reading (REALM) and comprehension (Cloze) assessments. Prior to multivariate analysis some independent variables were recoded based on their distribution and in an effort to ensure adequate power. Table 1 shows the recoded categories for participants’ sociodemographic and literacy characteristics. Lack of variability in the variable “first language” (91% English) meant that this was used for descriptive purposes only. The dependent variable, REALM grade level, was dichotomized into less than or equivalent to eighth grade and greater than or equivalent to ninth grade because it was highly skewed with a mean of 56.466 and variable transformation did not improve the skewness.

Logistic regression was used to examine which factors predicted reading ability (REALM scores), and the General Linear Model (GLM) procedure was used to examine which factors predicted comprehension ability (Cloze scores). Full models were tested against the constant only model to determine whether they were statistically different. Subsequent models, with nonsignificant ($p \geq .05$)

| Table 1. Participants’ Sociodemographic and Literacy Characteristics ($N = 214$) |
|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Age                     | Mean (SD, range) | 77.0 (7.9, 65–101) | 65–74 years     | 89 (41.6%)      | 75 years        | 125 (58.4%)     | Gender          | Male           | 80 (37.4%)      | Female          | 134 (62.6%)     | Years of education | Mean (SD, range) | 8.5 (2.8, 0–20) | ≤ 6 years       | 36 (16.8%)      | 7–8 years       | 68 (31.9%)      | ≥ 9 years       | 110 (51.4%)     |
| Previous occupation¹    | Managers/administrators, professionals, paraprofessionals | 29 (13.5%) | Clerks/salespeople | 35 (16.5%) | Tradespeople | 38 (17.8%) | Plant/machine workers, laborers | 40 (18.6%) | Home duties/volunteer | 72 (33.6%) | English as first language | 194 (90.7%) | Literacy habits: | Items read/week | Mean (SD, range) | 4.9 (2.4, 0–11) | ≤ 3 items | 67 (31.3%) | 4–6 items | 93 (43.5%) | ≥ 7 items | 54 (25.2%) | Frequency of seeking written health information | Very often/often | 44 (29.9%) | Sometimes | 75 (35.0%) | Rarely/never | 75 (35.1%) | Perception of reading ability | Very well | 112 (52.3%) | Well | 79 (36.9%) | Not well | 23 (10.7%) |

¹Measured according to the Australian Standard Classification of Occupations (Australian Bureau of Statistics, 1997).
interactions and main effects progressively removed, were also tested. The final model contained only the significant main effects and their interactions.

The statistical power for each nonsignificant analysis was calculated to determine the confidence with which conclusions can be drawn.

Results

Analysis of the Reading Level of Written Education Materials

Of the 16 public hospital occupational therapy departments approached, 12 (75%) provided written education materials. The 12 participating occupational therapy departments included six based in hospitals in the greater Brisbane area (100% of those approached), three based in hospitals in other metropolitan areas in Queensland (43% of those approached), and three based in hospitals in rural Queensland (100% of those approached). All four nonparticipating hospitals were based in metropolitan areas outside Brisbane.

A total of 110 written education materials were collected, including booklets (27.3%), single and multipage handouts (61.8%), and brochures or pamphlets (10.9%). Ten of the materials provided were duplicates. The mean number of written materials provided from the participating hospitals was 9.2 (ranging from 2 to 17).

In terms of the source of the materials, the majority, 80 (72.7%), were developed by occupational therapists. Nine (8.2%) were produced by State or Federal Health Departments, nine (8.2%) by self-help or support organizations such as the Arthritis Foundation and the Parkinson’s Association, eight (7.3%) were of unknown origin, and four (3.6%) were photocopied excerpts from books. Most of the materials (73 or 66.4%) provided information about home programs and self-management of conditions (e.g., “Back and Neck Care,” “Hemiplegic Self-Ranging Program”). The next largest category contained 16 (14.5%) materials about specific conditions (e.g., “Ankylosing Spondylitis,” “Arthritis”). Eight (7.3%) provided instructions on the wear and care of splints and pressure garments (e.g., “Splint Care Instructions”). Seven (6.4%) described services or facilities (e.g., “Aged Care Assessment Team”). Six (5.4%) provided information on assistive equipment (e.g., “Choosing a Bed”).

Reading Level of the Materials. The reading level of the 110 materials ranged from sixth-grade to college-graduate level (mean 9.8, SD 2.8). Of the 80 materials developed by occupational therapists, 39 (48.8%) were written at or above a ninth-grade reading level. Of the nine materials produced by self-help or support organizations or associations, two were written at a seventh- to eighth-grade reading level and the other seven were written at or above a ninth-grade reading level. Of the nine government produced materials, one was written at a fifth-grade reading level, six were written at a sixth- to eighth-grade reading level, and two were written at or above a ninth-grade reading level.

Materials with the lowest and highest reading grade levels were further analyzed. Materials on the wear and care of splints and garments had the lowest mean reading levels. All of these were developed by occupational therapists; in seven out of eight the information was presented in point form, with an average sentence length of 12.5 words (range 10.3–14.2). The average number of words with three or more syllables was 13.8 (range 6–25). The highest mean reading level scores were found for materials describing services and facilities. All but two were developed by occupational therapists and all contained sentences written in paragraph format. The average sentence length of these materials was 18.9 words (range 12.9–28.3). The average number of words with three or more syllables was 24.1 (range 13–45).

These results show that there was substantial variability in the reading levels of the analyzed materials, even among those developed by occupational therapists, and that long sentences and multiple syllabic words increased reading levels.

Analysis of Reading and Comprehension Levels

Participants. A total of 214 participants were recruited, representing 96.8% of the persons approached. Of the seven persons who declined participation (one male, six females), five did not feel well enough and two refused without explanation. Participants’ mean age was 77 years (SD 7.9, range 65–101 years) and more were female (134 or 62.6%). Their mean years of education was 8.5 years (SD 2.8, range 0 to 20 years) and the majority (90.7%) had English as their first language. On a weekly basis, participants read a mean of 4.9 items, most frequently newspapers (83.6%), men’s or women’s magazines (64.0%), letterbox “junk mail” (61.7%), and fiction books (61.2%). The majority (89.2%) perceived their reading ability to be high (i.e., read “well” or “very well”). The sociodemographic and literacy characteristics of the 214 participants are detailed in Table 1.

Reading Ability. Participants’ reading ability is presented in Table 2. Out of 66 words on the REALM, participants pronounced a mean of 56.4 words correctly (SD 9.6, range 16–66). This equated with a seventh- to eighth-grade reading level. Participants experienced more difficulty reading words as they increased in syllable length. The mean score for reading one- and two-syllable words (column one of the
REALM) was 20.4 (92.7%) out of a possible 22 compared to 16.4 (74.5%) out of a possible 22 for three- to five-syllable words (column three).

Participants' Reading Ability Compared to the Reading Level of Materials. The overall mean reading level of the 110 materials was ninth to tenth grade compared to participants' mean reading ability of seventh to eighth grade (see Table 2). There were 116 (54.2%) participants who could not read above eighth-grade level. They may have had difficulty reading 53 (48.2%) of the materials that had a reading level above eighth-grade level.

Factors Influencing Reading Ability. Logistic regression was performed to determine the influence of age, gender, years of education, socioeconomic status, literacy habits and perception of reading ability on participants' reading ability. Using less than or equivalent to eighth grade versus greater than or equivalent to ninth grade as the dichotomous dependent variable, the analysis revealed that perception of reading ability ($p = 0.001$) and occupation ($p = 0.001$) was independently related to participants' reading ability. Compared to those who rated themselves as not reading well, those who read well were between 6 and 11 times more likely to read at a ninth-grade level or above. Participants with a clerical or managerial or professional background were between five and seven times more likely to read at ninth-grade level or above compared to those with a background in trade, plant/labor, or home duties/volunteerism.

Comprehension Ability. Only those participants who had time or were comfortable with the process completed the comprehension tests (using the Cloze procedure). These tests required participants to insert missing words into three samples of materials of increasing reading level. Fifty-six (26.2%) of the 214 participants agreed to complete the three comprehension tests. Analyzed using independent samples $t$ tests and chi-square analyses, differences were found between participants who did and did not complete the comprehension tests in terms of age, amount they read, how well they perceived they read, and reading ability according to the REALM (see Table 3). There were no differences for gender, years of education, occupational status, and how frequently health information was sought. Table 4 shows participants' scores on the three comprehension tests.

Factors Influencing Comprehension Ability. Three General Linear Model procedures were performed to determine the influence of age, gender, years of education, socioeconomic status, literacy habits, and perception of reading ability on participants' scores on each of the three comprehension tests. Only age ($p = 0.018$) had a significant effect on participants' scores on the easiest comprehension test. Those 65 to 74 years of age had higher mean scores than those who were 75 years of age or older (means of 30.3 and 25.6, respectively). Analyses of the two harder comprehension tests were not significant. The effect sizes of the analyses of the comprehension tests of the materials that were of moderately hard and hard reading levels were 0.18 and 0.19 respectively, which are classified as medium effect sizes for linear regression analyses (Green, 1991). Given the sample size of 56, only large effect sizes (0.35) could have been detected with a power of 0.80 or above. To be able to confidently confirm that the medium effect size reported in this study was nonsignificant at a power of 0.80, a sample size of 100 would have been needed. Therefore the results must be interpreted with caution.

Discussion

Limitations of This Study

The principal limitations of this study are selection bias and power. The 214 participants were a convenience sample of older persons receiving rehabilitation at one public hospital during the period of data collection. Because participation was voluntary, the persons who agreed to complete the reading test may have self-selected because they felt that they could do the task. As well, 158 of the 214 participants approached declined to complete the comprehension test. Participants who agreed to complete the comprehension test and those who did not were significantly different.

<table>
<thead>
<tr>
<th>Table 2. Participants' Reading Ability Compared to the Reading Level of Materials</th>
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<tbody>
<tr>
<td>Reading Grade</td>
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<tr>
<td>----------------</td>
</tr>
<tr>
<td>≤ Grade 3</td>
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<tr>
<td>Grade 4-6</td>
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<td>Grade 7-8</td>
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<tr>
<td>≥ Grade 9</td>
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<table>
<thead>
<tr>
<th>Table 3. Differences Between Participants Who Completed and Did Not Complete the Comprehension Tests (Cloze Procedure)</th>
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<tbody>
<tr>
<td>Characteristic</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Mean age</td>
</tr>
<tr>
<td>Read ≥ 4 materials/week</td>
</tr>
<tr>
<td>Perceived they read very well</td>
</tr>
<tr>
<td>Reading ability ≥ Ninth-grade level</td>
</tr>
</tbody>
</table>
Table 4. Participants’ Comprehension of Materials With Different Reading Levels (N = 56)

<table>
<thead>
<tr>
<th>Material with seventh-grade reading level</th>
<th>Material with eighth-to ninth-grade reading level</th>
<th>Material with college graduate reading level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Total possible score = 41)</td>
<td>(Total possible score = 42)</td>
<td>(Total possible score = 39)</td>
</tr>
<tr>
<td>Mean (SD, range)</td>
<td>Mean (%) correct</td>
<td>Mean (%)</td>
</tr>
<tr>
<td>26.6 (8.6, 3–38)</td>
<td>65.3</td>
<td>19.5 (9.3, 0–33)</td>
</tr>
<tr>
<td>22.6 (10.5, 1–41)</td>
<td>54.3</td>
<td>50.1</td>
</tr>
</tbody>
</table>

Therefore the result estimates of the reading and comprehension tests are likely to be biased upwards. The comprehension component of the study was highly exploratory and only based on a small subset of participants. This small sample size restricted the power with which the results could be confidently confirmed.

Additionally, there is no way of knowing how representative the sample is of older clients who were in the hospital during the period of data collection, or how similar they are to the general population. The findings may not apply to persons living in other areas, persons of different socioeconomic and cultural backgrounds, and persons of other ethnicity. Participants who were invited to take part in this study were required to speak or read English well enough to give informed consent and complete the assessments, which may not be representative of older persons living in the city who use public hospitals. It is likely that the highly select sample in this study was more skilled in reading and comprehension than the broader population and that the discrepancy between the reading grade levels of written materials and the reading ability of clients in the general population is even higher than reported in this study.

Selection bias may have been present in the collection of brochures. As the occupational therapists knew the aims of the study, they may have chosen to send only those brochures they considered to be of a good reading level and presentation.

The reading test (REALM) cannot determine exact reading grade level. It can only estimate categories of reading ability as distinct from specific grade levels. It also has a ceiling effect, grouping all individuals with reading ability at or above a ninth-grade level into one category. The Flesh readability formula does not consider all aspects of the text that may influence comprehension such as text legibility, sequence, and clarity (Redman, 2001). Although longer words lead to the calculation of a higher reading level score, not all polysyllabic words are difficult for readers to understand.

**Overview of the Findings**

The results of this study highlight the importance to occupational therapists of determining the reading level of the written education materials they distribute to older persons, the match between the materials’ reading level and older clients’ reading ability, and clients with particular characteristics who may require specific assistance to manage written information. By giving attention to these issues, occupational therapists will be able to adopt a more effective, individualized, client-centered approach to their educational interventions.

Most of the written materials were provided by occupational therapists in metropolitan hospitals. These hospitals were large and contained specialist and rehabilitation services, which may increase the use of written education materials. The mean reading level of the 110 materials was between ninth and tenth grade as measured by the Flesch formula. The majority of materials were developed by occupational therapists and there was substantial variability in their reading levels. This variability suggests that not all occupational therapists are aware of or apply recommendations about the appropriate reading grade level for a general audience, and desirable content and design characteristics of written materials. When materials are written at a level too high to be easily read and understood they are of little benefit to the client (Wilson & McLemore, 1997). This is of particular concern for materials intended to assist clients to better manage their health conditions or continue therapy programs at home. Inability to use the information does not support the client’s autonomy, ability to assume responsibility for the management of his or her condition, or address the goal of improved health outcomes.

Analysis of the materials in this study highlighted that reading level was higher when multiple syllabic words were used. Use of medical terminology and specialized or “unfamiliar” words (e.g., atherosclerosis, prosthesis, neurological) as well as long (i.e., greater than seven letters) or multiple syllabic words (e.g., occupational, medication) increased the reading level scores of materials. Although it is generally recommended that unfamiliar or medical terminology should be defined and phonetic pronunciation of the words or inclusion of a glossary can be helpful (Bernier, 1993), the use of long or multiple syllabic words is not always a barrier to reading and interpretation. This is particularly the case when the words are familiar (such as cigarettes and hypertension) and when a health practitioner explains them (Sarna & Ganley, 1995). Written materials should not substitute for verbal information from health practitioners. They work most effectively when used in combination with verbal explanations (Redman, 2001). Materials containing lengthy sentences also had higher reading level scores. This
was in contrast to passages of texts that contained shorter sentences or were presented in bulleted form.

The mean reading level of the written materials, between ninth and tenth grade, was higher than participants’ mean reading ability, between seventh and eighth grade. Only 45.8% of participants could read at a ninth-grade level or above. According to Murphy et al. (1993) persons who have “trouble pronouncing words below a ninth-grade level will probably have difficulty comprehending most patient education materials” (p. 126). For older persons, who have been reported to have lower levels of literacy than their younger counterparts, careful attention to the reading levels of materials is required to ensure a match with their reading skills.

In terms of participants’ comprehension, the mean scores for correct word replacement in the three comprehension tests of easy to hard reading levels were 65.3%, 54.3%, and 50.1%, respectively. A score between 44% and 55% suggests that the reader is able to understand the material with supplemental instruction (Taylor, 1953). Scores for the two harder comprehension tests (eighth to ninth grade and college graduate reading levels) fell into this category. This is in comparison to the mean score for the easiest comprehension test (seventh-grade reading level), which indicated that participants could understand this material without difficulty. What was not determined in this study was participants’ interest in or familiarity with the topic of the materials. Adult learners tend to respond to materials when they are meaningful and relevant to them (Lorig, 2000) and this may have influenced the results.

The results of this study did not reveal the discrepancy between reported levels of schooling completed and assessed reading ability that other studies have found. For example, Davis, Crouch, Wills, Miller, and Abdehou (1990) found that 60% of participants read at least three grades below the school grade they last attended. In the present study, there was a general consistency between reported years of schooling (51.4% reported at or above a ninth-grade level, 31.8% a seventh- to eighth-grade level, 13.1% a fourth- to sixth-grade level, 3.7% a third-grade level and below) and their reading grade (45.8%, 42.1%, 10.7%, 1.4%, respectively) as assessed by the REALM. Further research is needed to determine the consistency between reported levels of schooling and assessed reading ability. If reported years of education can reliably be used to indicate reading ability, there would not be a need to formally test clients’ reading ability. This would be advantageous in terms of time, cost, and effort for the clinician and eliminate the potential for causing embarrassment to the client.

Factors Influencing Reading Ability. Two factors influenced participants’ reading ability. Participants with a prior managerial, professional, or clerical occupational background and those who perceived they read well or very well had a higher reading ability. Occupation is likely to be highly correlated with years of education, explaining the relationship found in this study (Australian Bureau of Statistics, 1996). That participants who perceived they read well did actually read well indicates that contrary to other findings (Baker, Johnson, Velli, & Wiley, 1996; Cooley et al., 1995), self-report may be a reliable method of determining reading ability. This may be the case if people read well, yet objective measures may be needed for poorer readers who may be embarrassed to admit or reveal reading deficiencies.

Factors Influencing Comprehension Ability. Only one factor influenced participants’ scores on one of the comprehension tests, although as previously noted, these results should be considered cautiously in light of the small sample size. On the test with the easiest reading level, younger participants had higher scores than older participants. Older persons generally have lower levels of education and a higher rate of disabilities that could affect literacy skills, such as reduced eyesight or cognitive processing (Australian Bureau of Statistics, 1996). This may have accounted for the outcome in this study, although age was not found to exert an influence on the comprehension tests of the more difficult text samples. This seems to indicate that more difficult passages are harder for everyone to understand regardless of age.

Implications of the Findings for Occupational Therapists

Given the potential for occupational therapists to use written educational materials in their everyday practice, it is important for them to be aware of the reading level and comprehensibility of materials they either produce themselves or distribute to clients from other sources. Occupational therapists must be mindful of clients’ literacy skills, including both their reading ability and comprehension. They may formally assess reading ability using quick reading assessments such as the REALM. Alternatively they may informally discuss with clients their previous level of schooling, educational achievement, and perceived reading ability. This study found that years of education reflected reading ability and persons who perceived they read well actually did have a higher reading ability.

To determine the reading level of written materials, a readability formula can be used to calculate the approximate reading grade level of the material. Alternatively, occupational therapists who use Microsoft Word to develop their own client education material can use the function available in Spelling and Grammar to generate reading ease statistics (Griffin, McKenna, & Tooth, 2003). The reading grade level of the materials can then be compared to the
results of the reading test (REALM) or the client's years of education to determine their suitability for that person.

For written information to be useful to the client, content and design characteristics of the materials should be considered in addition to reading level statistics (Paul, Redman, & Sanson-Fisher, 1997). Consideration should be given to a material's content, organization, layout, language, and illustrations.

**Content.** Written materials should have a clear purpose and contain accurate, balanced information (Coulter et al., 1998). Inclusion of a publication date enables the reader to discern how up-to-date the content is (Coulter et al.). Written materials are optimal when they contain practical information that helps the reader solve problems and achieve desired behaviors (Doak, Doak, & Root, 1996).

**Organization.** The use of subheadings, question and answer format, signposting of key messages, bullet points, and summaries can help readers to easily access and remember information (Doak et al., 1996).

**Layout.** Generous amounts of white space, serif typefaces, minimum 12-point font size, and good contrast between the text and the background have been recommended as strategies that can enhance the ability to read the material (Doak et al., 1996). Conversely, it is recommended that capitalizing and italicizing all letters of words and using Roman numerals should be avoided (Bernier, 1993).

**Language.** Regarding the language used in written materials, it is generally recommended that a fifth- to sixth-grade reading level would enable clients with a low level of literacy to read the content (Doak et al., 1996). Rather than competent readers feeling patronized by content written at this level, Buxton (1999) found that all readers prefer materials that are simple and concise. Short sentences of 8 to 10 words (Doak et al.) and short words of one to two syllables (Paul et al., 1997) are recommended. Common words should be used and jargon avoided (Doak et al.). If medical terms are used, these should be clearly defined. Content that is written in active voice and second person is thought to engage the reader (Boyd, 1987).

**Illustrations.** Illustrations should be used if they augment the message and are culturally appropriate. For this reason, cartoons and stylized drawings are not recommended (Bernier, 1993). Illustrations should be clearly labeled and located near the text to which they refer.

Instruments such as the Suitability Assessment of Materials (SAM) (Doak et al., 1996) and Paul et al.'s (1997) Checklist of Content and Design Characteristics can be used to evaluate written materials in terms of their adherence to principles known to enhance their effectiveness. SAM rates written materials on 22 items grouped under six factors (content, literacy demand, graphics, layout and typography, learning stimulation and motivation, and cultural appropriateness) as to the degree to which they meet set criteria on an ordinal scale that includes the anchor points of superior, adequate, not suitable, and not applicable. Scores for the applicable items are summed and the total is converted to a percentage with percentages of 70% to 100% indicating that a material is superior, 40% to 69% adequate, and 0% to 39% not suitable.

Paul et al.'s (1997) checklist contains 62 items organized into eight categories. Four of these relate to content, namely syntactic structure (e.g., use of short words and sentences) and semantic structure (e.g., coherence of the content and use of familiar words), attributes of the content (e.g., absence of ambiguity and expert endorsement of the content), and motivational strategies (risk behaviors are emphasized and desired behaviors specified). The other four relate to design characteristics and include physical attributes (e.g., simple typeface and good contrast between print and background), presentation techniques (e.g., use headings and one paragraph per topic), cueing strategies (e.g., repeat important points and put important points first), and illustrations and graphics (e.g., use color and realistic illustrations).

Table 5 provides a summary of the clinical practice recommendations that have arisen from the findings of this study.

<table>
<thead>
<tr>
<th>Table 5. Recommendations for Practice</th>
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<tr>
<td>Assess clients' reading ability, using the REALM, clients' years of education, or clients' perception of their reading ability.</td>
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<tr>
<td>Determine the reading level of written materials, using a readability formula or the spelling and grammar function in Microsoft Word.</td>
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<tr>
<td>Compare clients' reading ability with the reading grade level of materials to determine their suitability.</td>
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<td>Adhere to the following content and design characteristics when developing or critiquing written education materials for clients:</td>
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<tr>
<td><strong>Content</strong></td>
</tr>
<tr>
<td>- Ensure the purpose of the material is immediately apparent to the reader</td>
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<tr>
<td>- Ensure the content is balanced, accurate, and up-to-date</td>
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<tr>
<td>- Include a publication or revision date on all materials</td>
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<tr>
<td>- Provide how-to information of relevance to the reader's situation</td>
</tr>
<tr>
<td><strong>Organization</strong></td>
</tr>
<tr>
<td>- Use subheadings, question and answer format, signposting of key messages, bullet points, and summaries</td>
</tr>
<tr>
<td><strong>Layout</strong></td>
</tr>
<tr>
<td>- Use ample white space</td>
</tr>
<tr>
<td>- Use serif typefaces, minimum 12-point font size, and good contrast between the text and the background</td>
</tr>
<tr>
<td>- Avoid capitalizing all letters in words, italicizing, and the use of Roman numerals</td>
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<tr>
<td><strong>Language</strong></td>
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<tr>
<td>- Aim for fifth- to sixth-grade reading level</td>
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<tr>
<td>- Use clear, simple, common language, and short sentences and words</td>
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<tr>
<td>- Avoid jargon and define specialist terminology</td>
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<tr>
<td>- Write in active voice and second person</td>
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<tr>
<td><strong>Illustrations</strong></td>
</tr>
<tr>
<td>- Use instructive, culturally appropriate illustrations but only if they augment the message</td>
</tr>
<tr>
<td>- Position illustrations near the text they refer to</td>
</tr>
<tr>
<td>- Clearly label all illustrations</td>
</tr>
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</table>
Conclusion

This study explored the reading level of education materials given to older clients by occupational therapists in Queensland public hospitals. Due to the high reading grade levels of written education materials for clients and the discrepancy between reading ability and comprehension, there is a need to adopt a best practice approach that tailors educational materials to clients' needs. Practitioners need to use techniques, such as analyzing the reading level of materials, to ensure optimal client care. Applying the recommendations of this study may enhance the delivery of education so that it is more effective in increasing knowledge and facilitating clients' self-management of their health care.

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References


