Chapter 10

Addressing Health Literacy in the Design of Health Messages

Jakob D. Jensen

INTRODUCTION

A common goal of health communication research and practice is to identify messages that are accessible to target populations, including those with limited skills (U.S. Department of Health and Human Services [HHS], 2000). This is a challenge, as roughly 36% of U.S. adults may have limited or basic health literacy; that is, literacy and problem-solving skills that restrict their ability to navigate a variety of health situations (Gazmararian et al., 1999; Kutner, Greenberg, Yin, & Paulsen, 2006). Moreover, scientific discourse, the principal language of health, has become increasingly lexically complex over the last century (Hayes, 1992). As a result, health communicators are saddled with the task of conveying progressively dense information to an already under-skilled audience.

The purpose of the present chapter is to review research that has addressed how to design health messages for audiences with limited or basic health literacy. The first section defines health literacy as well as briefly reviews research examining its potential health implications. Message strategies are presented in the second section; three strategies are recommended based on available evidence. The final section identifies several promising areas for future research.

HEALTH LITERACY: DEFINITION AND IMPLICATIONS

Defining Health Literacy

The Institute of Medicine Committee on Health Literacy (2004) defined health literacy as "the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (p. 1). In his explication of health literacy, Baker (2006) argued that this definition encompassed two types of health-related literacy (print and oral), both of which were predicted by reading fluency and prior knowledge. Reading fluency is the ability to read and understand text (prose literacy), locate and use information (document literacy), and perform simple mathematical tasks (numeracy). Prior knowledge consists of familiarity with and understanding of key terminology (vocabulary) and grasp of basic underlying processes and frameworks (conceptual knowledge). Thus, people are functionally health literate if they can find needed health information and, once located, use prior knowledge to understand the textual and numerical information.

Measuring Health Literacy

Several existing measures capture one or more of the facets of health-related print literacy. The Health Activities Literacy Study (HALS) scale (Kutner et al., 2006; Rudd, 2007), the Test of Functional Health Literacy in Adults (TOFHLA; Parker, Baker, Williams, & Nurss, 1995), the Newest Vital Sign (NVS; Weiss et al., 2005), and the Talking Touchscreen (Yost et al., 2009) are measures of prose literacy, document literacy, and numeracy. The Wide Range Achievement Test (WRAT; Wilkinson, 1993), the Rapid Estimate of Adult Literacy Measure (REALM; Davis et al., 1993), and the Short Assessment of Health Literacy—Spanish and English (SAHL-S&E; Lee, Stucky, Lee, Rozier, & Bender, 2010) cover vocabulary. The WRAT is not health-specific, but it has been shown to correlate strongly with other measures of health-related print literacy (Parker et al., 1995). No measure of general health-related conceptual knowledge exists, although researchers have used issue-specific measures that might be more meaningful from a measurement standpoint or at least could serve as a model for the development of a general assessment tool (e.g., Macek et al., 2010).

Health-related oral literacy remains an understudied topic. Roter, Erby, Larson, and Ellington (2009) have investigated oral literacy in the past, and currently have federal funding to continue this research line. In addition, Baker

(2006) proposed that memory items from the Mini-Mental State Exam could serve as a proxy for listening ability (aural literacy), a facet of oral literacy. It should be noted that the term *oral health literacy* also describes a measure of dental vocabulary modeled after the original REALM (REALMD-30; Jones, Lee, & Rozier, 2007). The REALMD-30 is more aptly thought of as a context-specific measure of health-related vocabulary, and not a measure of speaking and listening ability.

Using one or more of these measures, researchers have found that roughly one third of Americans have health literacy deficiencies (Gazmararian et al., 1999; Kutner et al., 2006). As context, functional health literacy seems to be more prevalent than scientific literacy. Individuals are scientifically literate if they have sufficient vocabulary skills and conceptual knowledge to understand basic scientific concepts. Over several decades, Miller (2004) has consistently found that more than 80% of Americans are not scientifically literate. That said, based on current measurement practices, the threshold for functional health literacy may be lower than that for scientific literacy.

Implications of Health Literacy

Individuals with low health literacy are more likely to be male, 65 or older, less educated, have lower income, be without insurance, to have spoken a language other than English prior to entering school, and be Black, Hispanic, American Indian/Native American, or multiracial (e.g., Kutner et al., 2006). In sum, low health literacy appears to be more prevalent in populations traditionally underserved by the U.S. health care system. Fittingly, health literacy has been proposed as an explanatory mechanism for disparities (e.g., Jensen, King, Davis, & Guntzviller, 2010). This idea has historical grounding; individuals with lower socioeconomic status have often been denied the right to acquire reading skills in an effort to maintain traditional social hierarchies (Bernhardt & Cameron, 2003; Manguel, 1996).

Demographics aside, health literacy has been related to several cognitive abilities. Two studies conducted with senior citizens (Baker et al., 2002; Federman, Sano, Wolf, Siu, & Halm, 2009) revealed that health literacy was negatively correlated with performance on the Mini-Mental State Exam, a tool typically used to assess dementia. Seniors with inadequate health literacy struggled with attention, visual construction, and general orientation to time and place. Federman et al. also found that seniors with low health literacy had lower information recall (assessed using the Wechsler Memory Scale) and verbal fluency (assessed using the Animal Naming Test). In a sample of

low-income adults, health literacy was found to be positively correlated with critical thinking about health care (Jensen, King, Guntzviller, & Davis, 2010). Individuals with low health literacy were less likely to voice concern about their care. These findings are consistent with the idea that health literacy is related to executive functioning, or "the set of abilities required to effortfully guide behavior toward a goal" (Banich, 2009, p. 89). In fact, recent research has demonstrated that health literacy measures are positively correlated with traditional tests of executive functioning such as the Tower of London task, the Color Trails test, and the Applied Problems subtest of the Woodcock Johnson III—Tests of Achievement (Waldrop-Valverde et al., 2010). It is unclear whether deficiencies in executive functioning explain health literacy deficits or vice versa, but the relationship between the two is important in that health communicators should consider both when designing messages. In other words, health literacy measures may be detecting limited literacy skills as well as more general cognitive and motor impairments. Interventions or tools that address the former would still fail to address the larger needs of the impaired population. Approaches that provide increased time and assistance, above and beyond their basic literacy needs, may prove more effective at improving health outcomes.

Consistent with Baker's (2006) explication, health literacy is positively related to health knowledge. Functionally literate individuals have been found to possess greater knowledge of illness and disease (Kalichman & Rompa, 2000; Williams, Baker, Honig, Lee, & Nowlan, 1998; Williams, Baker, Parker, & Nurss, 1998) as well as informed consent (Miller, O'Donnell, Searight, & Barbarash, 1996), patient discharge instructions (Spandorfer, Karras, Hughes, & Caputo, 1995), and self-care after surgery (Wilson & McLemore, 1997). More importantly, health literacy is a significant predictor of health behaviors and outcomes (for a systematic review, see DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004). For example, health literacy is a significant predictor of global health status (Baker, Parker, Williams, Clark, & Nurss, 1997) and mortality (Sudore, Yaffe et al., 2006).

Thus, low health literacy is relatively common and more likely to be present in underserved populations. Health literacy is related to executive functioning, including recall and critical thinking, and is a significant predictor of health knowledge. Finally, individuals with low health literacy are less likely to perform health behaviors and therefore to have worse health outcomes. In light of these findings, it is not surprising that *Healthy People 2010* listed countering health literacy deficits as a major public health priority (Department of HHS, 2000).

EVIDENCED-BASED MESSAGE STRATEGIES

DeVellis (2003) argued that it is common for application to precede foundation. In other words, a solution is offered to or by practitioners before sufficient evidence exists to warrant any particular course of action. This situation is predictable because problems are often identified long before a viable response is validated.

Such is the case with health literacy, where knowledge of the problem far exceeds research evidence advocating any particular means of redress. As a stopgap measure, researchers initially recommended several message strategies culled from other areas—including graphic design, marketing, and education—that both logic and practice suggested might be well suited for reaching audiences with limited health literacy (e.g., Doak, Doak, Friedell, & Meade, 1998; National Cancer Institute, 1994). In many ways, the situation remains unchanged today; however, there is some evidence that three courses of action may be uniquely beneficial for low literacy audiences.

Lower the Reading Level

Messages can be constructed to match the skill level of the audience; for example, a brochure can be written so that it includes language accessible to someone with a fifth-grade reading level (or higher). Health literacy interventions have found that simply lowering the reading level of a health text can help low literacy populations comprehend the material (for a systematic review, see Pignone, DeWalt, Sheridan, Berkman, & Lohr, 2005).

Research has not identified an ideal reading level for health texts. If possible, communicators should make this decision in accordance with the specific abilities of their target population (Bernhardt & Cameron, 2003). Barring that, intervention studies have found beneficial results with reading levels as high as seventh grade (Davis, Holcombe, Berkel, Pramanik, & Divers, 1998) and as low as third grade (Coleman et al., 2003). The typical cutoff for functional health literacy is ninth grade (Davis et al., 1993), suggesting that using a reading level below this threshold is desirable. A simple way to check the reading level of a document in Microsoft Word is to perform a spell check. After the spell check, a readability window appears, reporting the reading level of the text (i.e., the Flesch-Kincaid grade level).

There is some evidence that lowering the reading level of health texts may improve outcomes for all populations (regardless of skill level). Kandula et al. (2009) found that all participants exposed to a multimedia diabetes education

program designed for low literacy audiences experienced equivalent learning gains. This is not entirely surprising since many health texts are lexically challenging (Doak et al., 1998; Hayes, 1992) and therefore possibly beyond the abilities of even most functionally literate audiences. It does suggest, however, that lowering the reading level of a text may be a good first step toward addressing literacy issues; that is, a necessary but insufficient means of effectively reaching low literacy groups.

Facilitate Hierarchical Learning

Knowledge is often hierarchical; to understand C, you must know A and B (Gagné, 1962). Functionally literate audiences may possess greater baseline knowledge and may be able to derive more implicit information from a message than their lower literacy counterparts. Thus, functionally literate audiences may be able to navigate knowledge that is not constructed in a hierarchical fashion.

Low literacy audiences may lack the necessary foundational knowledge to process a health message. Health communicators should try to identify the knowledge or learning hierarchy underlying their health message. Audience research and/or interviews with health professionals may help to reveal this structure as well as potential knowledge gaps that could hinder comprehension. Once identified, the hierarchical substructure of the specific health issue can serve as a template for presenting the information. In accord with research on learning hierarchies (Gagné, Mayor, Garstens, & Paradise, 1962), communicators should present information in a linear fashion to allow individuals with inadequate foundational knowledge to navigate the message successfully.

As an illustration, Gerber et al. (2005) developed a multimedia diabetes education intervention using Gagné's (1962) learning hierarchy approach. The intervention included multiple modules that could be completed separately in any order the participant desired. Each module had a distinct learning hierarchy that developed foundational knowledge before progressing forward. For example, many people need to be taught about blood sugar before they can understand diabetes or how to manage it. The intervention proved to be more effective than the control (a series of multiple-choice questions that attempted to teach in a question–answer format), but only for individuals with low health literacy. Among low health literacy participants with poor glycemic control at baseline, the intervention significantly decreased average blood glucose (A1c) levels.

Allow for Repetition

Individuals with low health literacy must overcome multiple obstacles (new terminology, unfamiliar learning hierarchies) to fully comprehend health information. Accomplishing this feat will likely require time as well as the ability to control pace and repetition of material. Functionally literate audiences may comprehend a message in the first pass whereas low literacy audiences may need to pause or repeat content, perhaps multiple times, a process that will invariably take more time.

Baker (2009) noted that this situation is consistent with mastery learning, which postulates that learning is a by-product of (a) time needed to learn divided by (b) time available for learning (Carroll, 1963; Guskey, 1997). The amount of time needed is largely dependent on the complexity of the learning hierarchy underlying the task and the individual's baseline knowledge of that hierarchy (e.g., Trembath & White, 1975). In his own work testing and extending mastery learning, Bloom (1968) suggested that more than 90% of people could master learning outcomes if they were given sufficient time to engage the material. Thus, mastery learning suggests that providing individuals with more time, to control their pace and repeat material if necessary, will improve learning outcomes. For this reason, mastery learning is well suited to educate individuals with learning difficulties and those with exceptional skill (e.g., Bloom, 1988; Guskey, Passaro, & Wheeler, 1995); although a meta-analysis of mastery learning interventions found that the technique was most effective at helping people with learning disabilities or executive function deficits (Kulik, Kulik, & Bangert-Drowns, 1990).

Several recent health literacy studies seem to demonstrate the validity of this postulate. Sudore, Landefeld et al. (2006) provided participants with an informed consent document and then tested their knowledge of the protocol. They observed that low literacy individuals needed more passes to master the material. In line with mastery learning, 80% of participants mastered the material following the second pass (compared to 28% on the first pass). A similar finding was observed by Sarkar et al. (2007) in their assessment of a diabetes education intervention. The intervention was carried out via an automated phone system through which newly diagnosed diabetics were called once a month and provided with educational content. The patients could repeat material (as many times as they liked) and control their own pace through the system. The researchers found that the intervention improved health outcomes, especially for low literacy patients. Just as important, low literacy patients were more likely to repeat content when using the system.

As noted earlier, Kandula et al. (2009) found that a multimedia diabetes education intervention yielded improved comprehension scores for all patients. However, a follow-up study demonstrated that, with repeat exposure to the material, low literacy participants were able to achieve similar learning outcomes (Baker, 2009). The repetition seemed to assist lower literacy individuals because it countered inequalities in baseline knowledge. That is, despite equal knowledge gain in the original study, the functionally literate participants still had higher comprehension scores overall, primarily because their baseline knowledge was higher than that of their lower literacy counterparts. In other words, functionally literate participants seemed to have more complete learning hierarchies prior to exposure. Through repetition, lower literacy participants managed to acquire the same knowledge.

Finally, Bickmore, Pfeifer, and Paasche-Orlow (2009) developed a software program that utilized relational agents (i.e., virtual people) to help explain a consent form. Participants in a lab study preferred the relational agent to a live person, primarily because they found it easier to control pace and ask questions when interacting with the software program. A variation of this software is currently being used to simulate checkout nurse behavior at a hospital. Patients interact with the relational agent via a touch screen computer. The virtual agent can repeat information at the patient's request. Early trial results suggest that low literacy patients have positive perceptions of the virtual agent and are more likely to request that information be repeated (Bickmore, 2009).

Mastery learning suggests that time is central to learning because it allows individuals to control pace and repeat material (if necessary). According to the theory, this is true of all individuals; however, it may be especially important for those with skill deficits (e.g., low health literacy). Health communicators should consider this need when developing health materials. Automated technology may be one vehicle for addressing this problem, but lower tech solutions can be constructed as well. For example, health communicators should make sure low skilled individuals have take-home materials or an opportunity to access information repeatedly.

PROMISING AREAS FOR FUTURE RESEARCH

There are still many questions that need to be answered concerning communication with low skilled audiences. In the following section, five questions are identified that suggest promising areas for future research. Research promise aside, all are issues that health communicators will want to consider when working with low health literacy populations.

Effects of Word Variation

Communicators have a tendency to vary word usage even when they mean the same thing as before. For example, a speaker might say "yearly," "annually," and "every twelve months" during a single exchange, despite the fact that nothing is intended by the shift in terminology.

Variation in terminology or phrasing is potentially problematic in that it creates a situation where misunderstanding is possible. Audiences with low health literacy may be especially prone to misunderstanding because their vocabulary is smaller and word variety may increase processing time. The alternative, using the same words/phrases on a consistent basis, referred to here as standardized language, could serve to enhance comprehension and reduce processing time.

Unnecessary language variation appears to be common in health communication. For example, health literacy research on pharmaceutical labels has found considerable variety in terminology and phrasing for relatively simple messages (Wolf et al., 2009). In addition, current labeling practices are confusing to adults with low health literacy (Davis et al., 2006). Efforts to improve pharmaceutical labels are ongoing (e.g., Davis et al., 2009; Shrank et al., 2009), yet the larger question is whether word/phrase variation has a meaningful impact on individuals with low health literacy. Intervention or lab studies investigating this issue would help to clarify whether standardizing language is a worthwhile endeavor.

Visual Message Features

Individuals with limited health literacy struggle with text; as a result, health communicators have often advocated the use of visuals with this population (e.g., Doak et al., 1998). Visuals can be still (e.g., brochure images) or moving (e.g., DVDs), and both have been implemented in health literacy interventions. Unfortunately, visuals have produced mixed results to date (for a review, see Pignone et al., 2005). For example, Gerber et al. (2005) constructed and evaluated a multimedia diabetes education program with limited text. Health outcomes did not vary between conditions; however, low literacy participants in the intervention condition did have higher perceived susceptibility to diabetes complications.

Research on visual information is ongoing. To advance, researchers need to develop a typology of visual message features. A typology is a categorization system based on conceptual distinctions. In his text on the construction of

typologies and taxonomies, Bailey (1994) argued that the first step is the identification of "key or fundamental characteristics on which the classification is to be based" (p. 2). This step will require a thorough review of research on visual images as well as careful thinking about how visual information varies.

A visual message feature typology is essential for the progression of knowledge because it is unlikely that visuals (generally) influence outcomes (generally). It is also uninteresting, as almost no accumulation of evidence could support that claim. Such first-order questions need to be replaced by more nuanced hypotheses about the impact of visuals; for example, how do [category X] visuals impact [outcome Y] in [population Z]? In line with this idea, Liu, Kemper, and McDowd (2009) found that explanatory visuals were less understood by older adults, presumably because the participants struggled to integrate that type of visual with textual information. Of course, this study would be even more informative if it were situated within a larger typology of visual message features. All of which would serve to address the issue of whether certain types of visuals improve learning or health outcomes for individuals with low health literacy.

Automated Communication

Mastery learning posits that some individuals will require more time to grasp material. Individuals with limited health literacy would seem to fall into this category; a reality that suggests the need for infrastructure that can afford users more time. Constraints of modern health care mean that it is unlikely additional human hours can be devoted to helping low skilled people navigate health material.

Given these constraints, the future seems to be automated communication interfaces that can tailor information for individual users (e.g., Sutherland, Campbell, Ornstein, Wildemuth, & Lobach, 2001) and/or mirror human interaction and allow for increased user control (e.g., relational agents; Bickmore et al., 2009). The success of these endeavors will rest heavily on integration of the technology into human environments and improving the fluidity of human–computer interactions. For example, Bickmore, Pfeifer, and Yin (2008) have considered the role of gesturing in human–computer communication to better model this behavior in automated exchanges.

A related issue that health literacy researchers should examine is how low skilled individuals react to automated communication interfaces and whether certain features increase their comfort level (e.g., Bickmore, Caruso, Clough-Gorr, & Heeren, 2005). One step in this direction is the development

of measurement tools for assessing low skilled individuals' attitudes, perceptions, and abilities in relation to automated communication technologies. Psychometric tools will help advance preliminary research on audience analysis and provide validated instruments for what will likely be an explosion of automated communication research over the next few decades.

Powerless Language

Language can be described as powerful or powerless (Hosman & Siltanen, 2006). Powerful language is certain and assertive (e.g., eating five fruits and vegetables a day prevents cancer) whereas powerless language is uncertain and hedged (e.g., survey studies suggest that eating five fruits and vegetables a day may reduce lifetime risk of developing colon cancer).

In science communication, powerless language is both normative (Zehr, 1999) and equated with control (Jensen, 2008; Meyer, 1997). That is, good scientific communicators demonstrate knowledge and skill by hedging their claims. Unfortunately, powerless language is often removed as the typical progression of scientific discourse is from uncertainty (when presented to colleagues) to certainty (when presented to the public; Star, 1983). Originally, hedges were removed because science communicators wanted scientists to be esteemed in the eyes of the masses (Zehr, 1999). More recently, streamlining seems to be pursued on the grounds of readability.

Researchers should examine how audiences with low health literacy react to powerful and powerless language. It will be tempting to cut powerless language from science, because it may seem like unnecessary lexical complexity. This may be true, but communicators should be mindful of the fact that much of the increased lexical complexity in science (Hayes, 1992) is a by-product of terminology. Hedging, on the other hand, is not inherently dense; whether it should be cut is a matter that researchers will want to consider. One argument in favor of preserving hedging is that it may help audiences to process health messages without experiencing negative cognitive backlash, like fatalistic thinking (Jensen et al., 2011).

Concerns About Simplification

In a larger sense, message design for low literacy audiences often involves the removal of content. Terms like *simplify, plain,* and *cut* are commonly used; words that imply reduction are currently considered to be the best path to

improving communication with low skilled groups. The present chapter is not completely immune to this trend. After all, lowering the reading level of a message is a type of simplification. Yet communicators should be wary of omitting material, especially when it pertains to personal or public health. Simplifying a message may increase readability, but it could also decrease comprehension of the issue at hand (e.g., by disrupting text cohesion; see Liu, Kemper, & Bovaird, 2009). Approached differently, cutting information could be overkill, or at least a less efficient means of achieving improved communication.

The idea that simplification is an effective means for improving communication is pervasive at the government level. Federal agencies in the United States are currently required to adhere to plain language guidelines (www.plainlanguage.gov). Few of the guidelines have an evidence base because most are culled from common practice or writing textbooks. On the website, practitioners are offered several examples to illustrate plain language principles including a before-and-after comparison of a revised Medicare Beneficiary Services letter. The before version reads as follows ("Medicare fraud letter," n.d.):

> Investigators at the contractor will review the facts in your case and decide the most appropriate course of action. The first step taken with most Medicare health care providers is to reeducate them about Medicare regulations and policies. If the practice continues, the contractor may conduct special audits of the provider's medical records. Often, the contractor recovers overpayments to health care providers this way. If there is sufficient evidence to show that the provider is consistently violating Medicare policies, the contractor will document the violations and ask the Office of the Inspector General to prosecute the case. This can lead to expulsion from the Medicare program, civil monetary penalties, and imprisonment.

The after version is revised to read:

> We will take two steps to look at this matter: We will find out if it was an error or fraud.
> We will let you know the result.

The latter has been simplified, yet one wonders if the meaning of the document remains intact. Alternatively, it could be argued that the latter is an entirely new message rather than a simplified version of the former. All of which raises questions about the logic, effect, and ethics of attempting to improve communication by simplifying, cutting, or reducing the content. Communication practitioners may find it unacceptable to provide low skilled

groups (or all groups) with information that is simple but incomplete. Such an approach could obscure comprehension as well as elicit a number of other unintended message effects (see Cho & Salmon, 2007). For instance, a weight loss pamphlet from the U.S. Department of Health and Human Services, utilized as an example on the plain language website, originally included information about moderate exercise along with several behaviors ("Losing weight safely," n.d.):

> The Dietary Guidelines for Americans recommends a half hour or more of moderate physical activity on most days, preferably every day. The activity can include brisk walking, calisthenics, home care, gardening, moderate sports exercise, and dancing.

The revised plain language version cut the reference to moderate exercise, all but one example, and rephrased the time interval.

> Do at least 30 minutes of exercise, like brisk walking, most days of the week.

Not only does this eliminate the idea that people should engage in moderate exercise, but it also assumes that low skilled audiences will more efficiently process one example as opposed to six. It seems equally plausible that low skilled groups will benefit from more examples (e.g., increased repetition, possibility to expand baseline knowledge). In light of these problems, both researchers and practitioners should consider simplification carefully.

Conclusion

Low health literacy is a barrier that may explain service gaps and disparities. Addressing this problem is a major health priority, and one that seems to be situated within the health communication domain. The present chapter advocated three courses of action for those designing health messages: lowering the reading level, facilitating learning hierarchies, and allowing for repetition of content. All three are supported by evidence suggesting utility with low health literacy populations. There are also many promising research lines related to health literacy, and it is likely that at least some of these will lead to fruitful improvements in message design. However, both researchers and practitioners should be cautious about promoting or adopting message strategies that lack a solid evidence base. Message simplification, for example, is a potentially problematic practice that needs to be scrutinized. Indeed, more research on health

literacy in general is the best approach at the moment and the one most likely to yield significant gains in public health.

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Suggested Additional Readings

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Questions for Theory and Practice

1. Is health literacy sufficiently distinct from literacy?
2. If health literacy gaps are a by-product of executive functioning deficits, does that change how health communication practitioners approach this issue?
3. If knowledge is hierarchical, then what baseline knowledge is necessary for understanding current colonoscopy guidelines for U.S. adults 50+ years of age?
4. Other than automated communication, how can health communication practitioners provide low health literacy populations with sufficient opportunities to repeat health information?
5. What types of visuals might be effective at increasing comprehension with low health literacy populations?
6. Is it ethical to provide low literacy audiences with less information than others? What if future research suggests that low literacy audiences can comprehend only simplified messages?