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PUBLIC HEALTH | RESEARCH ARTICLE

Effectiveness of using picture-based health education for people with low health literacy: An integrative review

Jungmin Park[1] and Julie Zuniga[1]*

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*Corresponding author: Julie Zuniga, School of Nursing, The University of Texas at Austin, 1700 Red River St., Austin, TX 78701, USA
E-mail: jzuniga@nursing.utexas.edu

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Abstract: *Background*: Level of health literacy affects health status. The purpose of this study was to examine and evaluate studies related to picture-based health education materials for people with low health literacy. *Methods*: Articles from 2001 through October 2015 were searched in the PubMed, CINAHL, and ERIC databases on the web, followed by manual searches of the references in those articles. *Results*: Of the 11 studies that met the inclusion criteria for this review, 10 showed a positive effect of increasing the health learning abilities of people with low health literacy using picture-based health education. Medication adherence was targeted most often. The majority of the studies measured health literacy using the Short Test of Functional Health Literacy in Adults, but the health literacy measurements in picture-based health education were nonetheless inconsistent. *Discussion:* Use of picture-based health education for people with low health literacy was limited. However, the majority of the studies did indicate a positive effect on learning.

Subjects: Education; Health and Social Care; Medicine, Dentistry, Nursing & Allied Health

Keywords: picture-based health education; low health literacy; cartoon; pictograph(s); illustration; integrative review

1. Introduction

Health literacy has been defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Nielsen-Bohlman, NetLibrary, & Institute of Medicine (US) Committee on Health

ABOUT THE AUTHORS

Jungmin Park is a doctoral candidate in the University of Texas at Austin, School of Nursing. Her research interest includes disease self-management by people in the HIV-infected population who have co-morbid conditions. Her dissertation focuses on retention in care for elderly people with HIV and diabetes. Jungmin Park currently serves as a research assistant on a study regarding self-management education of diabetes in HIV-infected people under the supervision of Dr Julie Zuniga, an assistant professor in the University of Texas at Austin, School of Nursing. Also, Jungmin is currently conducting a qualitative study investigating type two diabetes self-management education using pictography with low health literacy funded by the Sigma Theta Tau, Eplison Theta Tau.

PUBLIC INTEREST STATEMENT

Low health literacy affects to negative health outcomes. The purpose of this manuscript is to integrate studies related to picture-based health education materials for people with low health literacy. In this paper, we used the online database and searched articles manually from 2001 to October 2015 under the PRISMA guideline. Ten articles indicate that picture-based health education materials helps to increasing the health learning abilities of people with low health literacy.

Literacy, 2004). In the US, 36% of adults have no more than basic health literacy (Kutner, Greenburg, Jin, & Paulsen, 2006). Most of those with low health literacy are elderly (over 65 years old), belong to minority groups, are refugees or immigrants, have a low educational level, have a low socioeconomic status, or are nonnative speakers (U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2010).

People with low health literacy have many difficulties in managing their health problems (Arcia, Bales, & William Brown, 2013; Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005) and as a result experience longer hospitalizations and more frequent use of emergency care. This may be due in part to difficulty accessing the correct medication, and understand labels and health messages (Arcia et al., 2013; Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011). Those with limited health literacy are therefore more likely to become ill than those with higher health literacy (Garcia-Retamero, Okan, & Cokely, 2012).

Health education materials, however, are not always appropriately written for those with low health literacy, and the materials that do take low health literacy into account are limited. Health education materials are often written for a 10th-grade reading level (Davis et al., 1993; Doak, Doak, Friedell, & Meade, 1998) but the reading ability of people with low health literacy can be below the 5th-grade level (Kirsch & Educational Testing Service, & National Center for Education Statistics, 1993). One way to address this health knowledge gap is to use picture-based educational materials.

The Mayer's cognitive theory of multimedia learning (CTML) insisted three principles: (1) people process information through auditory and visual channels, (2) each channel has a limited amount of memory, and (3) learning consists of actively filtering and sorting information (Mayer & Ebooks Corporation, 2009). Given these principles, multimedia, which may be defined as "the combination of text and pictures," should help improve an individual's capacity to learn (Sorden, 2012), and the CTML is indeed based on the idea that learners can improve their learning abilities when they are presented with pictures as well as words (Choi, 2015; Mayer & Ebooks Corporation, 2009). Thus, the combination of pictures and words increases learning effectiveness (Mayer, 1947/2014; Sorden, 2012).

Following the Mayer's CTML theory, pictographs may increase the effectiveness of educational materials for those who have low literacy (Garcia-Retamero et al., 2012) especially for complex health information (Austin, Matlack, Dunn, Kesler, & Brown, 1995; Delp & Jones, 1996). However, pictographs encompass many different picture-based educational materials in a diverse health education fields, such as simple black and white line drawings, pictures, and simple drawings with simple text. The purpose of this integrative review is to synthesize studies associated with pictographic education designed for people with low health literacy, describe the characteristics of pictographs use, assess the tools used to measure health literacy in picture-based health education studies, and integrating the effectiveness of picture-based health education for people with low health literacy.

2. Methods

2.1. Search strategy

For this study, we systematically reviewed articles found with two main search methods: (1) electronic searches using key words in library databases, and (2) subsequent manual searches for related references. On the Internet, we searched three databases: PubMed, the Cumulative Index of Nursing and Allied Health Literature (CINAHL), and the Education Resources Information Center (ERIC). Search terms were as follows: *photo novella, education, cartoon, webtoon, pictograph, pictogram, illustration, picture, visualization, health, nonliterate*, and *literacy*. The research on picture-based materials for health education is limited, so we did not limit the time period for the review. Through an ancestry search, additional research studies were identified by searching reference lists that had inclusion criteria and purposes that were related to those of this review. The search strategy and data extraction are illustrated in Figure 1.

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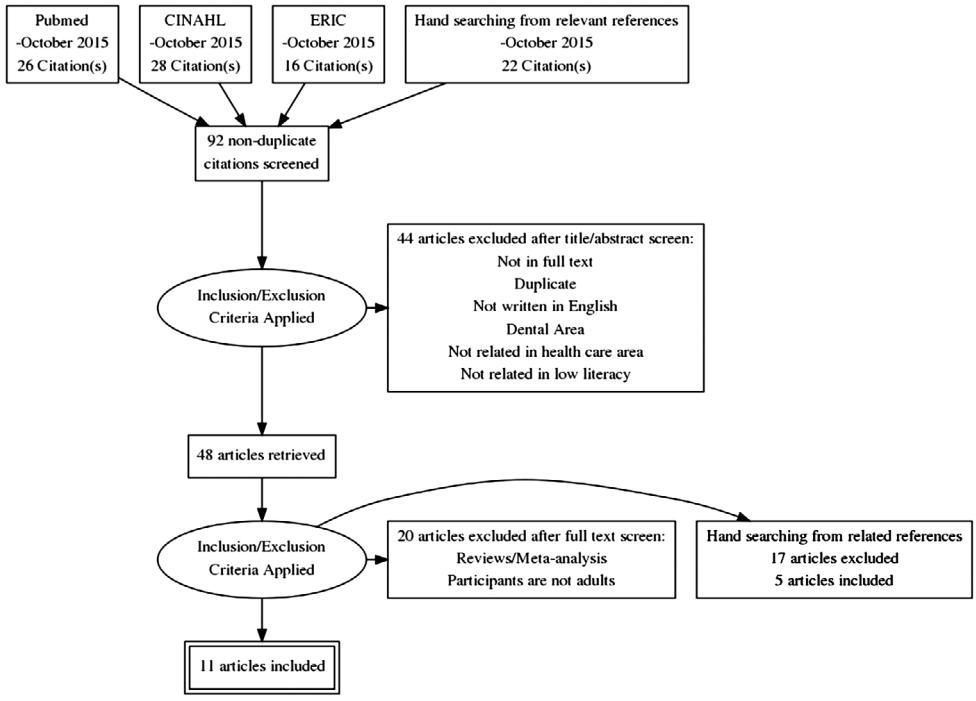

Figure 1. Search flow chart using http://prisma.thetacollaborative.ca.

2.2. Inclusion and exclusion criteria

This study was guided by inclusion and exclusion criteria: (1) English-based studies, (2) studies related to low health literacy, (3) studies use picture-based health education, (4) study participants are adults (over 18 years old), (5) studies are not reviews or meta-analyses, and (6) studies are not dental related.

2.3. Data extraction

Initially, the web-based search identified 70 articles in PubMed, CINAHL, and ERIC. Manual search of the references in those articles found an additional 22 articles, for a total of 92. After screening the 92 articles by title, key words, and abstract, 44 articles were excluded because they were editorials or presented only abstracts, were duplicates, were not written in English, applied to dental health of youth, were unrelated to health care, or did not consider participants' levels of health literacy. Full texts of the remaining 48 articles were then read. Review of those 48 articles led to exclusion of 20 articles from the web-based search because (1) the participants were not adults (over the age of 18), or (2) the articles were reviews or meta-analyses. A total of 17 articles from the manual search were also excluded after applying the same inclusion and exclusion criteria.

3. Results

3.1. Study samples and settings

The web-based search and the manual search yielded a final total of 11 articles (six from the web-based search, five from manual search) that met the inclusion criteria (see Table 1). Although there was no limit on the time period for the studies, all 11 articles were published from 2001 to 2015. The studies' sample sizes ranged from 6 to 500, and the samples included a broad range of participants. The final 11 articles included six cross-sectional descriptive studies (Choi, 2011, 2012, 2013; Chuang, Lin, Wang, & Cham, 2010; DeWalt et al., 2004; Kripalani et al., 2007) and seven interventions (Choi, 2015; DeWalt et al., 2004; Dowse & Ehlers, 2001, 2005; Kalichman et al., 2013; Kripalani et al., 2007; Mansoor & Dowse, 2003) with two of the articles presenting both descriptive studies and interventions (DeWalt et al., 2004; Kripalani et al., 2007) (see Table 2). The participants' ethnicities were diverse: Hispanic/Latino, White, African American, and Asian. The most common educational level

Table 1. Characteristics of picture-based health education strategies designed for patients with low health literacy

Study	Purpose	Setting	Sample characteristics	Design	Disease focus	Literacy measures	Key findings
Choi (2011)	To develop and validate pictograph-based discharge instructions for older adults after hip replacement surgery	United States	Experts assess appropriateness, accuracy, relevance	Tool development and evaluation	Hip replacement surgery	Not appropriate	Pictographs (simple line drawings) assist engagement and are easy to understand for low-literate immigrant refugees in discharge care actions
			N = 5				
			Age range: 39–51 years				
			Clinical experience: 5–15 years				
			2 White, 2 AA, 1 Asian				
Choi (2012)	To develop breast healthcare instructions using pictographs	United States	Immigrant women with low health literacy	Pilot study	Breast health care	S-TOFHLA ≤ 22	Pictographs (black and white simple line drawings) are effective regardless of race/ethnicity
			N = 6	Tool development and evaluation			
			Age range: 37–55 years				
			Living in US: ≥10 years (83.3%)	Cross-sectional study			
			Edu. level: high school (66.7%)				
			Hispanic/Latino (66.7%)	Interviews			
			Asian (16.7%)				
Choi (2013)	To examine the acceptability and comprehension of instructions in 15 low-literate older adults	United States	Convenience sample *N* = 15 (82.4% women)	Pilot study	Hip replacement surgery	S-TOFHLA ≤ 22	Pictographs are effective for low-literate older adults' discharge instructions in acute health care
			Mean age 68.2 years	Cross-sectional study			
			Edu. level: ≤high school (80%)	Interviews			
			White (73%)				
			S-TOFHLA *M* = 19.47				
Choi (2015)	To examine the effect of pictograph-based discharge instructions on comprehension & recall of older adults with low health literacy	United States	Conv. sample ≥ 65years w/LHL	RCT	Hip replacement surgery	S-TOFHLA ≤ 22	Intervention group had significant improvement in scores on comprehension, $t(35) = -2.29$, $p = 0.02$, and recall, $t(35) = -2.24$, $p = 0.03$, vs. the comparison group
			N = 42 (28 women, 66.7%)	4 weeks discharge instruction education			
			Mean age 67.59 years				
			Edu. level: ≤high school (83.3%)				
			White (69%)	Interviews			
			STOEFLA *M* = 17.02 (*SD* = 5.16)				
			Intervention group *N* = 21				
			Women (66.7%)				
			White (47.6%)				
			Mean age 68.3 years				
			Edu. level level: ≤high school				
			S-TOFHLA *M* = 15.95 (*SD* = 1.43)				
			Comparison group *N* = 21				

(*Continued*)

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Table 1. (*Continued*)

Study	Purpose	Setting	Sample characteristics	Design	Disease focus	Literacy measures	Key findings
			Women (66.7%)				
			White (90.5%)				
			Mean age 66.9 years				
			Edu. level: ≤high school				
			S-TOFHLA *M* = 18.1 (*SD* = 7.09)				
Chuang et al. (2010)	To compare low-literacy patients and medical staff for preference and comprehension of pictographs intended to illustrate medication use instructions for medical clinic ambulatory patients	South Taiwan	Convenience sample *N* = 500	Prospective study	Medication	Education level	Patients and medical staff had significant differences in preferences for all categories of medical instruction pictographs and had significant differences in comprehension for the pictographs' administration associated with meals. Patients' preferences and comprehension of the medical instruction pictographs were age related
			Patients *n* = 250	Cross-sectional study		≤Elementary school	
			Age M ≤ 60 years (43.2%)	Survey		(Grades 1–6)	
			Women (54.4%)				
			Men (45.6%)				
			No schooling (61.6%)				
			Medical staff *n* = 250				
			Age M ≤ 60 years (100%)				
			Women (92%)				
			Male (8%)				
			Edu. level: college degree (86%)				
			Job: Nurse (64.8%)				
DeWalt et al. (2004)	Development and pilot testing of a disease management program for heart failure patients with low literacy	United States	*N* = 23	Tool development and pilot test	Heart failure	REALM	Heart failure management program leads to significant improvements in self-care behavior and heart-failure-related symptoms for patients with low literacy
			Mean age 60 years	Pre-post test		S-TOFHLA	
			Men (60%)	Self-report		<9th grade literacy level	
			AA (60%)	3 months before and after study			
			Income ≤$15,000/year (74%)	1 h educational section			
			Married (67%)	Supportive phone calls over six weeks			
			Mean education (years): 9.6				
			REALM M: 33% (5th grade)				
			S-TOFHLA: 52% inadequate reading level				
			M knowledge score: 67.3				
			M self-efficacy score (8–32): 30%				
			M MLHFQ score (0–105): 57.3%				

(*Continued*)

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Table 1. (*Continued*)

Study	Purpose	Setting	Sample characteristics	Design	Disease focus	Literacy measures	Key findings
Dowse and Ehlers (2001)	To evaluate the use of pharmaceutical pictograms in low-literate South Africans	South Africa	Xhosa ethnic group who had attended school for no more than seven years	Pre-post test	Medication	A short literacy test	Pictographs combined with text are effective for comprehension and recall
			N = 46 (35 women, 76.1%)	3 weeks		Education level ≤7 years schooling	Pictograms communicate medication information
			Age 41–65 years (56.5%)	Interviews			Participants prefer local pictograms ($p < 0.05$)
			Edu. level 5–7 years (55.3%)				
Dowse and Ehlers (2005)	To determine the influence of medicine labels incorporating pictograms on the understanding of instructions & on adherence	South Africa	Xhosa ethnic group attending an outpatient clinic, who had been prescribed a short course of antibiotics and had attended school for no more than10 years	RCT	Medication	Education level ≤10years	Pictograms significantly increase patients' understanding of instructions and adherence ($p < 0.01$)
			N = 87	Within 3–5 days intervention			Control group average for understanding, 69.5%
			Experimental	Interviews			Control group average adherence, 71.5%; experimental group, 89.6% ($p < 0.01$)
			(Text & pictogram labels)				
			n = 46 (42 women, 91.3%)				
			Age 21–40 years: 45.7%				
			Edu. level 5–7 years (41.3%)				
			Language: isiXhosa (80.4%),				
			English (19.6%)				
			Control (text only)				
			n = 41 (38 women, 92.7%)				
			Age 21–40 years (61%)				
			Edu. level 5–7 years (19, 36.6%)				
			Language: isiXhosa (70.7%), English (34.1%)				
			Percentage for understanding instructions				
			Experimental group: 95%				
			Control group: 70%				
Kalichman et al. (2013)	To test the efficacy of a pictograph-guided adherence skills building counseling intervention for adults with limited literacy living with HIV	United States	Have HIV & receiving antiretroviral therapy	RCT	HIV	TOFHLA	Interventions or adherence counseling may be required or beneficial for patients with low or marginal literacy skills regardless of their use of pictograms

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Table 1. (*Continued*)

Study	Purpose	Setting	Sample characteristics	Design	Disease focus	Literacy measures	Key findings
			N = 446	Audio computer-ized self-interviews			
			Pictograph guided *n* = 148				
			Mean age 46.7 years (70% men)				
			Edu. level 12years				
			HIV + testing: 14 years				
			HIV symptoms: 5.1 years				
			Income < $10,000/year (69%)				
			TOFHLA < 85% correct (58%)				
			Standard adherence *n* = 157				
			Mean age 47 years (73% men)				
			Edu. level 12 years				
			HIV + testing: 13.6 years				
			HIV symptoms: 5 years				
			Income < $10,000/year (71%)				
			TOFHLA < 85% correct (53%)				
			General health improvement				
			n = 141 (65% men)				
			Mean age 47.8 years				
			Edu. level 11.9 years				
			HIV + testing: 13 years				
			HIV symptoms: 4.9 years				
			Income < $10,000/year (75%)				
			TOFHLA < 85% correct (40%)				
Kripalani et al. (2007)	To describe the development, implementation, and preliminary evaluation of an illustrated medication schedule that depicts a patient's daily medication regimen using pill images and icons	United States	*N* = 209	RCT	Medication	REALM	Pill card improved medication management and understanding for those with limited health literacy, low levels of education, and cognitive function impairments ($p < 0.05$)
			Frequent use of pill card (83%)	Pill card assess-ment			

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Table 1. (*Continued*)

Study	Purpose	Setting	Sample characteristics	Design	Disease focus	Literacy measures	Key findings
			AA, 191 (91.4%)	Tool development and intervention			
			Women, 122 (58.4%)	3rd month interview			
			Mean age 63.7 years				
			Edu. level ≥ 12 years (110, 52.6%)				
			REALM: 87 inadequate, 41.6%				
			MMSE ≥ 24 (64.6%)				
			All patients had coronary heart disease, 99% had hypertension.				
			Diabetes mellitus: 46%				
			Hypercholesterolemia: 87%				
			Prescribed medications: 6				
Mansoor and Dowse (2003)	To access the effect of incorporating pictograms on understanding in low-literate participants	South Africa	Xhosa low-literacy participants with a maximum of 7 years of formal schooling	RCT	Medication	Education level ≤7 years schooling	Text-and-pictogram-based information creates a significantly higher level of understanding than text-only information ($p = 0.05$)
			N = 60 (39 women, 65%)				
			Age 21–40 years (68.3%)				
			Edu. level Grades 5–7th, 40 (66.7%)				
			Experimental group, text and pictogram information				
			n = 30 (60% women)				
			Age 21–40 years (76.7%)				
			Edu. level 5–7th grades (60%)				
			Control, text-only information, asked to read medicine labels and patient information leaflet				
			n = 30 (70% women)				
			Age 21–40 years (60%)				
			Edu. level 5–7th grades (73.3%)				

Notes: REALM—rapid estimate of adult literacy in medicine; TOFHLA—test of functional health literacy in adults; S-TOFHLA—short test of functional health literacy in adults; AA—African American; Edu.—education; MLHFQ—minnesota living with heart failure questionnaire; MMSE—mini-mental state examination; SEAMS—self-efficacy for appropriate medication use scale.

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Table 2. Study characteristics

Study	Research design	*N*	References*
Descriptive	Cross-sectional	6	Choi (2011, 2012, 2013), Chuang et al. (2010), DeWalt et al. (2004), Kripalani et al. (2007)
Intervention	RCT	5	Choi (2015), Dowse and Ehlers (2005), Kalichman et al. (2013), Kripalani et al. (2007), Mansoor and Dowse (2003)
	Pre-post test	2	DeWalt et al. (2004), Dowse and Ehlers (2001)

*References include duplicate studies.

was no more than high school (Choi, 2012, 2013, 2015). In 3 articles (Dowse & Ehlers, 2001, 2005; Mansoor & Dowse, 2003), the participants' education levels were 5–7 years; in 1 article (Chuang et al., 2010), 61.6% of the participants had no schooling in a patients group and 86% had college degrees in a medical staff group; in another (Kripalani et al., 2007), 52.6% of the participants had more than 12 years of schooling. Seven of the articles (63.6%) (Choi, 2011, 2012, 2013, 2015; DeWalt et al., 2004; Kalichman et al., 2013; Kripalani et al., 2007) presented studies conducted in the US, and the remaining 4 (36.4%) (Chuang et al., 2010; Dowse & Ehlers, 2001, 2005; Mansoor & Dowse, 2003) presented articles conducted elsewhere (South Africa and South Taiwan).

3.2. Studies' characteristics

Five descriptive studies (Choi, 2011, 2012, 2013; DeWalt et al., 2004; Kripalani et al., 2007) consisted of picture-based educational tool development and evaluations using interviews to determine whether a pictographic health education approach was effective or not for people with low health literacy. Of the 7 interventions, 5 (Choi, 2015; Dowse & Ehlers, 2005; Kalichman et al., 2013; Kripalani et al., 2007; Mansoor & Dowse, 2003) were randomized controlled trials; the other 2 (DeWalt et al., 2004; Dowse & Ehlers, 2001) were single-group pre-post studies. The total weighted mean age across the intervention studies was 49.4 years, based on the 3 articles (Choi, 2015; DeWalt et al., 2004; Kripalani et al., 2007) that provided the participants' mean ages. Several different methods were used to collect data: 1 article (Kalichman et al., 2013) used audio-computerized self-interviews (ACASI), and 1 article (DeWalt et al., 2004) used paper self-report data collection. The interventions varied in length from 3 days to 3 months.

3.3. Study designs and picture-based development fields

There were four types of study designs: tool development (n = 4), tool development and evaluation by experts (n = 1), tool development and evaluation by patients (n = 3), and tool evaluation only (n = 7) (see Table 3). The health conditions focused upon in the picture-based development were medication adherence (n = 5), hip replacement surgery (n = 3), breast healthcare (n = 1), heart failure (n = 1), and human immunodeficiency virus (HIV; n = 1).

3.4. Characteristics of pictographs

Studies used pictographs for low health literacy people. The majority of the studies used simple black and white pictographs (n = 4). Five studies used pictographs to assist patients with their medications (Chuang et al., 2010; Dowse & Ehlers, 2001, 2005; Kripalani et al., 2007; Mansoor & Dowse, 2003). Most studies used pictographs were conducted in the US (n = 7). Ten of 11 articles were the positive effect of increase understanding health education materials.

3.4.1. Health literacy assessment tools

Four different tools were used to assess health literacy: the Test of Functional Health Literacy in Adults (TOFHLA; n = 1), the Short Test of Functional Health Literacy in Adults (S-TOFHLA; n = 4), the Rapid Estimate of Adult Literacy in Medicine (REALM; n = 2), and the Short Literacy Test (n = 1), along with education level (n = 5).

Table 3. The analysis of study components

Feature	Articles* (*N* = 11)	References*	Participants** (*N* = 1,439)
Study design			
Tool development and evaluation by experts	1	Choi (2011)	5
Tool development and evaluation by patients	3	Choi (2012), DeWalt et al. (2004), Kripalani et al. (2007)	238
Only tool evaluation	7	Choi (2013, 2015), Chuang et al. (2010), Dowse and Ehlers (2001, 2005), Kalichman et al. (2013), Mansoor and Dowse (2003)	1,196
Health literacy measurement			
TOFHLA	1	Kalichman et al. (2013)	446
S-TOFHLA	4	Choi (2012, 2013, 2015), DeWalt et al. (2004)	86
REALM	2	DeWalt et al. (2004), Kripalani et al. (2007)	232
Education level	5	Chuang et al. (2010), DeWalt et al. (2004), Dowse and Ehlers (2001, 2005), Mansoor and Dowse (2003)	716
Not present	1	Choi (2011)	5
Short literacy test	1	Dowse and Ehlers (2001)	46
Study setting			
United States	7 (63.6%)	Choi (2011, 2012, 2013, 2015), DeWalt et al. (2004), Kalichman et al. (2013), Kripalani et al. (2007)	746
Other countries	4 (36.4%)	Chuang et al. (2010), Dowse and Ehlers (2001, 2005), Mansoor and Dowse (2003)	693
Study fields			
Hip replacement surgery	3 (27.3%)	Choi (2011, 2013, 2015)	62
Breast healthcare	1 (9.1%)	Choi (2012)	6
Medication	5 (45.4%)	Chuang et al. (2010),Dowse and Ehlers (2001, 2005), Kripalani et al. (2007), Mansoor and Dowse (2003)	902
Heart failure	1 (9.1%)	DeWalt et al. (2004)	23
HIV	1 (9.1%)	Kalichman et al. (2013)	446
Health education materials format			
Only text based	0	None	0
Only pictography based	0	None	0
Simple text and pictography based	11 (100%)	Choi (2011, 2012, 2013, 2015), Chuang et al. (2010), DeWalt et al. (2004), Dowse and Ehlers (2001, 2005), Kalichman et al. (2013), Kripalani et al. (2007), Mansoor and Dowse (2003)	1,439

Notes: TOFHLA—test of functional health literacy in adults; S-TOFHLA—short test.

*References include duplicated studies.

**Number of participants studied, whether participants were experts or patients.

The reading levels in the studies that used the S-TOFHLA were reported as marginal or inadequate (S-TOFHLA ≤ 22) in the majority of the studies. If the researchers used years of education, the variables were dichotomized, using the cut off of elementary, less than middle school, or less than high school.

3.5. Relationship between pictography and health education effect

All of the articles described the effectiveness of using pictographs for health education for those with low health literacy. Studies measured effectiveness by using interviews, paper-based self-reports, and questionnaire surveys. Pictography made low health literacy people easy to understand. Ten of the 11 articles (Choi, 2011, 2012, 2013, 2015; Chuang et al., 2010; DeWalt et al., 2004; Dowse & Ehlers, 2001, 2005; Kripalani et al., 2007; Mansoor & Dowse, 2003) found a positive effect of

pictographic educational materials on health self-management, regardless of race/ethnicity and country of origin. However, in Kalichman et al. (2013) the pictograph and adherence to counseling did not improve outcomes in persons with low literacy, though it was effective in persons with moderate health literacy. They surmised that patients with low literacy will need more intense interventions than a brief counseling session to overcome this barrier.

3.6. Effectiveness of pictography for health education

All of the articles (Choi, 2011, 2012, 2013, 2015; Chuang et al., 2010; DeWalt et al., 2004; Dowse & Ehlers, 2001, 2005; Kalichman et al., 2013; Kripalani et al., 2007; Mansoor & Dowse, 2003) combined simple text and pictography. The most common pictographic health education materials featured black and white simple-line drawings with simple text (Choi, 2011, 2012, 2013, 2015). These pictographic health education materials helped to make the information understandable and successfully conveyed healthcare messages to people with health literacy (Choi, 2011, 2012, 2013, 2015). For heart failure patients, the pictographic health education improved self-care behavior (DeWalt et al., 2004). In the medication studies, pictographs with simple text increased the recall of instructions (Chuang et al., 2010), were successful in communicating medication information (Dowse & Ehlers, 2001), were easy to understand (Dowse & Ehlers, 2005; Kripalani et al., 2007; Mansoor & Dowse, 2003) and helped patients remember medication information (Kripalani et al., 2007).

4. Discussion

The 11 articles in this integrative review focused primarily on health literacy measurements, specific health conditions, and the picture-based format of health education materials for people with low health literacy. The review suggests several key findings.

First, communication about health-related subjects with those who have low health literacy is challenging (Arcia et al., 2013). Pictographic representation, however, is beneficial for comprehension and communication in health care (Arcia et al., 2013). Nevertheless, the areas of healthcare that currently use picture-based education for people with low health literacy are limited. In addition, although limited health literacy is affected by age, no studies have focused on the use of pictographic education for the aging population. There is need for more diverse health-related research studies using pictography-based health education materials for elderly.

Currently there are no standard tools for the assessment of health literacy, thus it is difficult to compare levels of health literacy across the studies reviewed here (Berkman et al., 2011). Several of the studies used the dichotomous variable of years of education, but that is not always an appropriate measurement. Health literacy measurements may focus on assessing reading, comprehension, and numeracy (Jordan et al., 2013), but years of education do not provide an accurate measurement of those components. To accurately measure health literacy, future researchers will need more meaningful and consistent health literacy assessment tools.

Finally, picture-based educational materials significantly improved participants' understanding of their health. Most of the studies reported positive results for using pictographic educational materials in healthcare. All 11 of the articles demonstrated the effectiveness of pictographic health education materials increasing patients' learning abilities in different countries, and one article directly pointed out that pictographic health education is effective regardless of race/ethnicity (Choi, 2012). However, one article of HIV education indicated that using picture-based materials did not result in any difference, because people with low health literacy may need more intensive approaches to improving their health. Overall, most of the health education materials currently available are not appropriate for people with a low health literacy level, so improved materials are highly needed.

This integrative review determined what health focus areas were addressed by picture-based health education, the trends that exist in picture-based health education for people with low health literacy, the best health literacy measurements for people with low health literacy, and the

effectiveness of picture-based health education for improving the health status of people with low health literacy.

5. Conclusions

In the US, substantial numbers of adults find it difficult to understand data about their health (Arcia et al., 2013). People's levels of health literacy affect their health and their health management in many ways (U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2010). Low health literacy can lead to greater chances of missing crucial information and therefore causes higher error rates in patients' judgments and decisions about their illnesses (Garcia-Retamero et al., 2012). This results in a direct influence on the status of their illness (Garcia-Retamero et al., 2012). There is a positive relationship between understanding one's health data and improving one's health self-management (Arcia et al., 2013). However, despite attempts to address patients' low health literacy, the majority of materials provided to people with low health literacy are written by people with a high reading level (Badarudeen & Sabharwal, 2008; Goodfellow, Trachimowicz, & Steele, 2008; Helitzer, Hollis, Cotner, & Oestreicher, 2009; Hill-Briggs & Smith, 2008; U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2010) and health-care experts have followed only some of the recommendations made for working with people who have low health literacy (Schwartzberg, Cowett, VanGeest, & Wolf, 2007; U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion, 2010). In this integrative review, we sought to explore which areas of healthcare have used picture-based health education for those with low health literacy and, ultimately, how effective those materials have been. So far, the areas of healthcare using picture-based health education for people with low health literacy have been limited, although the majority of studies indicated a positive effect on learning ability.

5.1. Strengths and limitations

Most studies indicated that using picture-based health education materials for people with low health literacy had a positive effect on health care. But few picture-based health education studies met the inclusion criteria for this integrated review. In addition, the studies were reviewed by only two authors, which may have led to bias; however, the two authors did review the studies three separate times and also subjected their process to review by peer colleagues. There were not many studies that have been done so far; any generalizability of the findings might be limited. Moreover, there were few intervention studies and few participants for assessing the effectiveness of pictographic health care education. In the future, more intervention studies and greater numbers of participants would enable generalizability. In addition, most of the pictographic health care education focused on medication; few studies addressed other healthcare areas. In the future, more research needs to be done on picture-based education in additional areas of healthcare and on a wider range of diseases in order to evaluate its effectiveness.

5.2. Practice implications

In order to address low health literacy needs, healthcare professionals should evaluate their current patient education for reading level and low-literacy acceptability. Reading levels can be assessed using the health measurements tools such as S-TOFHLA, and REALM. Patient education handouts should be on a reading level below 5th-grade level (Kirsch & Educational Testing Service, & National Center for Education Statistics, 1993). If there is a lack patient education materials tailored for low health literacy, healthcare professionals can create patient education material using picture-based information. Pictures should be simple, clear, and culturally tailored for easy to understand. Appropriate picture-based health education materials would make it easier for such people to understand health information, as opposed to text-based health education materials alone.

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Author details
Jungmin Park[1]
E-mail: jungminpark@utexas.edu
Julie Zuniga[1]
E-mail: jzuniga@nursing.utexas.edu
[1] School of Nursing, The University of Texas at Austin, 1700 Red River St., Austin, TX 78701, USA.

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