How Education Level and Willingness to Learn Affect Older Adults in Their Use of Mobile Technology in Southwest Idaho

Kimberly Neagle: McNair Scholar

Dr. Kathryn Demps: Mentor

Anthropology

Abstract

As a person's age increases, their use of technology decreases (Casado-Muñoz, 2015), which can hinder their access to resources, such as medical care, online products and services, and basic communication. Previous research shows that if seniors have higher education levels and willingness to learn, they are more likely to use technology (Bailey & Sheehan, 2009). This project used the cultural evolution theory and social learning to examine how education levels affect a senior's use of technology, and how their willingness to learn affects their adoption of mobile technology. Seventy individuals were surveyed, aged 65 years or older: 45 individuals enrolled currently in educational courses and 25 individuals who are not. Although there were no significant findings found, this research gives a deeper understanding of the factors that influence technology use in seniors, and how to encourage such usage. Keywords: Elderly, Mobile Technology, Technology, Older Adults

Introduction

Culture is essentially learned and shared behaviors. Henrich defined it as information acquired by individuals via social learning (2003). This social learning, turning into behavioral adaptations, is one of the many reasons the human species has been so successful. A distinct characteristic of the human species is the reliance on social learning practices and cultural transmissions for our acquisition of knowledge. The result is adaptation and to get there takes effort, insight, experiments, error, and interaction. Cultural evolution theory gives the ability to predict how people acquire knowledge socially at different ages by measuring skill variation and knowledge (Henrich, 2003).

By applying cultural evolution theory to social learning, we can better understand how factors such as education and willingness affect the way elderly adults adopt mobile technology. This is important for two reasons. First, as a person's age increases, their use of technology decreases (Casado-Muñoz, 2015), which can hinder their access to resources, such as medical care, online products and services, and basic communication. For 90% of American adults, the use to technology is part of their daily lives (Pew Research Center, 2014). Second, technology has revolutionized access to resources. Many Americans use the internet for medical purposes such as advice and support, to find a local health professional, or to seek medical information. A third of online Americans agree that the internet has greatly improved their ability to shop and pursue hobbies (Pew Research Institution).

Technology, in general, provides people with a more comfortable way of life. It has the ability to make changes on societal, cultural, and economic levels (Nasser, 2005). Only a tenth of the United States' population does not own a mobile phone (Pew Research Institution). People who adapt to technological changes will benefit from them and those who do not, fall behind and could suffer. For example, a case study revealed that strong communication with friends and family significantly improved the recovery from depression seen in the elderly (Nasser, 2005). Previous research has shown that if seniors have higher education levels and willingness to learn, they are more likely to use technology (Bailey & Sheehan, 2009). This research offers a better understanding of that factors that influence technology in older adults and contextualizes ways to encourage technological use.

Literature Review

Technology is evolving faster than it ever has, specifically Information and Communications Technology or ICT which is an umbrella term for communication devices, (Rouse, 2006). This has ushered in many changes in the way people communicate with their friends and loved ones and new forms are popping up every day. For

example, a survey conducted on transnational families show the different ways they have communicated throughout the years. Before the 1990's people relied on letters for communication with their loved ones because telephones were too expensive, once these rates dropped mid-1990s an increase in telephones showed. By the late 1990s an explosion of new communications methods was introduced by the internet, particularly, email (Wilding, 2006). "The ability to use information and communications technology (ICT) is now assumed by most commentators to be a prerequisite to living in the 'information age'" (Selwyn, 2004).

Given this reality and the fact that the elderly are the fastest growing population in the United States there is some concern that the elderly will be left behind. By 2050 one in every five Americans will be over the age of 65 (Touhy & Jett, 2012), and research shows that as age increases our use of technology decreases. In addition, it is commonly accepted that people learn more slowly as then get older because childhood and adolescence are typically sensitive learning periods where most cultural learning takes place. For example, one case study on honey collectors in India observed that around 20 years of age there was a significant decline in the ability or motivation to acquire new skills, knowledge or beliefs. They also noted that as age increased the variation in the amount of knowledge decreases. Unfortunately, the elderly of today are considered to be in this category of falling behind and ultimately suffering from it (Li & Perkins, 2007). Falling behind technology can be deeply negative for the elderly. ICTs can be a lifeline for the elderly, and being cut off from technology means being cut off from resources and basic communication needs (Wong & Chen, 2014).

Two theories originally presented by Cumming and Henry relate to technology use in later life: the theory of disengagement and the activity theory. The theory of disengagement states that withdrawal comes with aging created by a decrease of interaction with society. This process starts at retirement when an individual is unable to work. Along with withdrawal, older adults disregard social roles becoming frustrated and eventually isolated. This process is natural and occurs over time. The activity theory states that aging involves maintaining the activities they participated in middle age throughout later life, for as long as they are able. Once they can no long participate in those activities there is a substitution for new activities (Cumming & Henry, 1961).

Intelligence also seems to be a topic of debate for the disconnect between the elderly and technology. Two of the most prominent arguments are about the elderly's general fluid intelligence and crystallized intelligence. The general fluid intelligence declines with age and is the most crucial for leaning; it gives the ability to reason and problem solve. Crystallized intelligence remains with age and includes life experience and acquired knowledge. Because general fluid intelligence declines with age, it means that the elderly will learn new skills slower than a younger person (Barbosa & Amaro, 2012).

However, age is subjective so that decline does not happen at the same time for everyone. There are four non-chronological indicators of age that affect how older people learn and acquire new skills. The first is function age, which refers to a person's physical and cognitive abilities compared to another person the same age. The second is perceived age or the age they feel. This is often an indicator of wellbeing. The third is social age, which is their age based on social and cultural experiences. Finally, there is cognitive age, which refers to how they feel, combined with physical attributes, interests, and activities (Barbosa & Amaro, 2012). Therefore, age alone is not the only factor that affects intelligence.

Research shows that if technology is introduced in the workplace, it is more likely to be used in later life. For the present cohort of people aged over 70, some suggest that ICTs came too late in life for that to pertain to them. Ethnographic research has shown that giving an older adult time to mess around with new technologies, without any expectations put on them, eases the process and builds the individual's confidence—this process removes the fear aspect (Bailey & Sheehan, 2009). As older adults' familiarity with new technology increases, the more they enjoy it and are more willing to adapt (Li & Perkins, 2007). This information negates the common stereotype that connects the low rate of ICT use in the elderly population to technophobia.

This stereotype may be because the elderly have the lowest rates of ICT usage; however, it is a myth and many are enjoying the benefits of technology (Barbosa & Amaro, 2012). And what the literature seems to indicate is that education level is a more critical factor than age in an older adult's willingness to learn about new technology. According to a Li and Perkins study, the higher level of education a person has the more positive and motivated they are to learn new technology (2007). This study examines the effects that aging has on the cultural transmission of technological knowledge by looking at an older adult's ability, location, and previous experience, which were factors used in Dr. Demps study (Demps, Zorondo-Rodriquez, Garcia, & Reyes, 2012). To examine these factors, three hypotheses were proposed. The first is older adults who have higher education levels are more likely to use mobile technology than those who have lower education levels. The second hypothesis is older adults who are willing to take an educational class on technology are more likely to use mobile technology than those who are not. The final hypothesis is technophobia will be seen more frequently in low mobile technology users.

Methods

This study has been deductive so there was an initial question and data collected around it. This research is a case study because I was unable to randomize my participants and selected them purposely. I received approval through the Institutional Review Board for this research study on June 23, 2016, IRB #028-SB16-120. Structured interviews were conducted in the form of a questionnaire. It was created with 26 questions that took participants about 10 minutes to complete. My target population was men and women 65 years of age and older. To measure the effects that education had on technology use, there were two specific populations targeted. The first were older adults enrolled in educational courses through The Boise Park and Recreation Center. These participants can take educational courses through the center at their own leisure with a paid membership. The second group were older adults who were not enrolled in any educational courses and have not taken a class in the last 10 years. These older adults are independently living in senior citizen apartment complexes in Eagle, Idaho.

To distribute the survey to The Boise Park and Recreation participants, an electronic survey was distributed to participants who offered email addresses. The participants who did not, were sent a paper survey in the mail. To distribute the paper survey to participants who have not taken an educational course, I went to their apartment complex and got permission to distribute the survey. They completed it and handed it back in when they were done. The number of participants goal was originally 50, with 25 enrolled in educational courses and 25 who have not taken any classes. I ended up with 25 not enrolled and 45 currently enrolled.

I collected the 25 surveys over a 3-week period. Once I received a survey, I immediately put the information into a profile matrix in Excel, with a list of variables in the columns and the participants in the rows. Waiting for all the surveys to come in from the Boise Parks and Recreation community took a bit longer. The online survey was created through Qualtrics, which allowed me to import the data to Excel. As the paper surveys came in, I manually put them into the database as well. Once all data was collected, the variables and data were coded. Statistical analysis was conducted through Excel using line regressions and t-test to examine statistical significance.

To initiate the analysis of the data collection, univariate analysis was examined to look at the populations single descriptive variables. By looking at each one of my hypotheses, I could sketch charts to visually see how I wanted to interpret my results. Analysis started by summing up the total number of participants and finding the central tendency measures of descriptive variables like age, years since retirement, and years of formal education. Within these variables mean, standard deviation, and mode was found. Frequency distribution for the ages of participants was also checked to see how spread out they were.

The first hypothesis, older adults who have higher education levels are more likely to use mobile technology than those who have lower education levels, was analyzed visually with bar charts and statistically with regression tests on education level, each technological variable, and the combined technology use.

The second hypothesis, older adults who are willing to take a class on technology are more likely to use mobile technology than those who are not, was analyzed visually with a bar and line chart, and statistically by using a linear regression model test and a t-test: Two-Sample Assuming Unequal Variances through Excel. First, willingness to learn was compared to each individual piece of technology and then compared to the combined sum of technology that each participant used.

The final hypothesis, technophobia will be seen more frequently in low mobile technology users, was analyzed first by summing up the older adults who marked fear as one of the feelings they felt when introduced to new technology, for both populations. Afterward, regression analysis and t-tests were performed to see the statistical significance.

Results

Population

The older adults who were not enrolled in educational courses and living in a senior citizen apartment complex have an average age of $M = 77.4$ years, $SD = 7.28$. Fifty-six percent of these older adults were in the 70-79 age range. They have been retired on an average of $M = 16.08$ years, $SD = 11.52$, and have a combined average of $M = 12.88$ formal years of education, $SD = 2.31$.

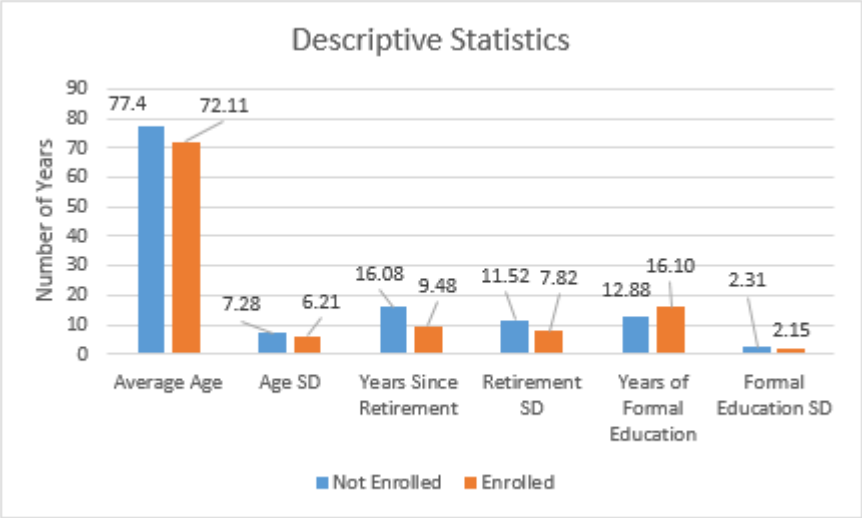

Figure 1. Descriptive Statistics of both population samples.

The older adults who are enrolled in educational courses with different living situations have an average age of M = 72.11 years, SD = 6.21. Fifty-four and a half percent of these older adults were in the 70-79 age range as well. This group has been retired for an average of M = 9.48 years, SD = 7.82, and have a combined average of M = 16.10 formal years of education, SD = 2.15.

Hypothesis 1

The first hypothesis is older adults who have higher education levels are more likely to use mobile technology than those who have lower education levels. Figure 2 shows the average combined technology use including email, tablet, cell phone, and landline plotted on top of the average number of years of formal education. For the older adults not enrolled in educational courses they used technology $M = 14.24$, $SD = 34.27$. Those enrolled in educational courses had higher technological use $M = 22.6$, $SD = 36.59$. Figure 3 compares number of formal education years and combined technological use.

A linear regression was calculated to predict combined technological usage based on number of formal years of education for both populations. For the participants not enrolled in educational courses, a non-significant regression equation was found ($F(1,22) = 0.041$, $p > 0.84$), with an R^2 of 0.002. Participants predicted technological use is equal to 12.927 + (-0.001) (education level) number of times used combined in seven days when education level is measured in number of years. Participants' technological usage decreased -0.001 for each year of formal education.

There was also a non-significant regression found for the participants currently enrolled in educational courses ($F(1, 43) = 0.22$, $p > 0.64$), with an R^2 of 0.005. Predicted technological use is equal to 135.096 + (-2.790) (education level) number of times used combined in seven days when education level is measure in number of years. Participants' technological usage decreased -2.790 for each year of formal education.

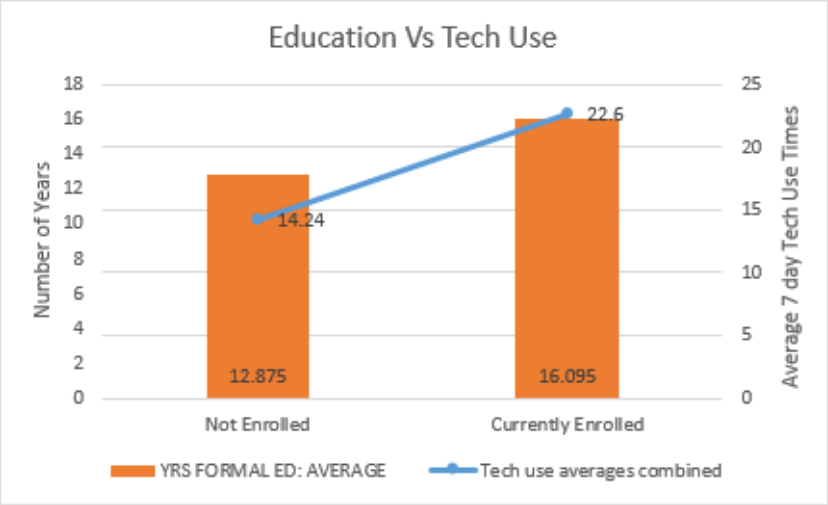

Figure 2. Years of formal education with total combined technology usage for each population.

Although there was no significance found in the overall technology usage, there was one significant finding when looking at the technology individually compared to years of formal education. A linear regression was used to predict tablet use based on years of formal education. Significance was found ($F(1,43) = 5.83$, $p < 0.02$), with an R2 of 0.119. Predicted technology use is equal to 92.67 - 4.83 (education level) number of times used combined in seven days when education level is measure in number of years. Participants' technological usage increased for each year of formal education. The findings for the rest of the variables are presented in Table 1.

Table 1. Linear Regression: Number of Education Years vs. Each Technology

Linear Regression: Education level vs Each technology							
		Not Enrolled			Currently Enrolled		
Category	Category	*n*	p-value	R Squared	*n*	p-value	R Squared
Education Level	Cell Phone	24	0.39	0.034	45	0.82	0.001
Education Level	Landline	24	0.76	0.004	45	0.67	0.004
Education Level	Email	24	0.72	0.006	45	0.36	0.019
Education Level	Tablet	24	0.99	7.024	45	0.02*	0.119

*Significant finding at the alpha 0.05 level.

Hypothesis 2

Hypothesis 2 predicts technology use based on willingness to learn. Figure 3 shows a bar graph with each population response to whether they would be willing to take an educational course on technology use. The older adults not enrolled in educational courses were close to even with 12 saying they would take a course and 13 saying they would not. The older adults who are currently enrolled in educational course were a lot more varied with 39 being willing to take the course and only six saying they would not. On top of this bar chart is a line graph showing actual combined technological use.

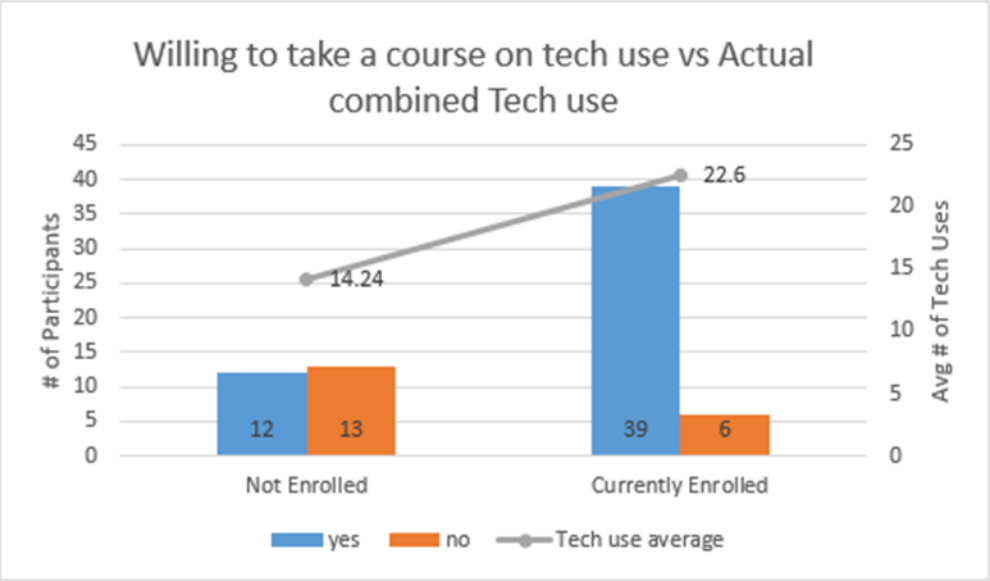

Figure 3. Willing to take a course on tech use with actual combined tech usage for both populations.

A linear regression model was calculated to predict overall technological use based on willingness to take an educational course on technology in the older adults who are not enrolled in educational courses. There was no significant prediction of technological use by willingness to take an educational course ($F(1,23) = 1.79$, $p > 0.19$), with an R^2 of 0.072. Predicted technological usage is equal to 29.07 + 58.09 (willingness) combined technological usage when willingness to take a course is measured.

Table 2. Results of t-Test for Both Populations

t-Test: Two-Sample Assuming Unequal Variances							
		Not Enrolled			Currently Enrolled		
Category	Category	*df*	p-value	t stat	*df*	p-value	t stat
Willingness	Combined Tech Use	24	0.017*	-2.56	44	1.06	-7.02
Willingness	Cell Phone	24	0.009*	-2.86	44	3.14	-5.34
Willingness	Landline	24	0.020*	-2.50	44	0.0003*	-3.87
Willingness	Email	24	0.047*	-2.10	44	2.00	-4.78
Willingness	Tablet	24	0.162	-1.44	44	0.003*	-3.20

*Significant finding at the alpha 0.05 level.

There was also no significant prediction when using a linear regression of technological use by willingness to take an educational course on older adults who are currently enrolled in educational courses ($F(1, 43) = 2.81$, $p > 0.10$), with an R^2 of 0.061. Predicted technological usage is equal to 143.83 - 61.65 (willingness) combined with technology use when willingness to take a course is measured.

Table 2 shows the results of the t-test: two-sample assuming unequal variances. For the older adults who are not enrolled in educational courses, everything was significant except willingness and tablet use. For the older adults who are currently enrolled in educational courses, the only significance was in landline and tablet use with willingness to learn. The significant findings show that there is an actual difference between the means.

Hypothesis 3

The final hypothesis is technophobia will be seen more frequently in low mobile technology users. The results show technophobia was seen in both populations with almost half, 42.86%, answering that they felt fearful when introduced to a new piece of technology. For the not enrolled population 9 out of 24 said they felt fearful, and with the currently enrolled population, 18 out of 42 said they felt fearful with new technology.

A linear regression was calculated to predict technophobia based on total technological usage for older adults not currently enrolled in educational courses. No specific prediction was found ($F(1,19) = 1.72$, $p > 0.21$), with a R^2 of 0.082. Predicted technology usage is equal to 89.58 - 68.36 (technophobia) combined technological usage when technophobia is measured.

A linear regression was also used to predict technophobia based on total technological usage for older adults currently enrolled in educational courses. No specific prediction was found in this case either ($F(1, 43) = 2.81$, $p > 0.100$), with a R^2 of 0.061. Predicted technological usage is equal to 143.83 - 61.65 (technophobia) combined technological usage when technophobia is measured.

Table 3 lists the results from a two-sample t-test assuming unequal variances. For the population not enrolled in educational courses, each category except email and tablet had a significant difference between the means. For the population who is currently enrolled in educational courses the only significant difference between the means is between landline and tablet uses.

Table 3. t-Test Results for Both Populations

t-Test: Two-Sample Assuming Unequal Variances							
		Not Enrolled			Currently Enrolled		
Category	Category	*df*	p-value	t stat	*df*	p-value	t stat
Fearfulness	Combined Tech Use	20	0.017*	-2.56	41	5.21	-6.65
Fearfulness	Cell Phone	20	0.018*	-2.28	41	4.58	-5.28
Fearfulness	Landline	20	0.038*	-2.27	41	0.01*	-3.77
Fearfulness	Email	20	0.069	-1.92	41	3.18	-4.67
Fearfulness	Tablet	20	0.221	-1.26	41	0.01*	-3.37

*Significance found at alpha 0.05 level.

Discussion

This study examined how education level and willingness to learn affected the use of older adults' mobile technology in Southwest Idaho. Although there was no specific significance found with the analysis, there have been insightful findings that can encourage technological usage among the older adult community.

The population of older adults not enrolled in educational courses on average were older and have been retired longer than the population enrolled in educational courses. Both populations had almost half participants in the same age distribution. The older adults currently enrolled in educational courses on average had higher levels of education. Li and Perkins revealed that their intelligence and age theories alone cannot predict how older adults age and make decisions to learn new technology (2007). This small sample is an example of that as well. The data was unable to predict what factors influence technological usage in older adults.

The first research question examined the effect of technological usage based on education level. Along with education, older adults currently enrolled in educational courses also had an overall higher technological usage when combining cellphone, landline, email, and tablets. There was no overall significance for either population that predicted technological use based on number of formal education years. There was a significant finding when looking at the technology individually in the currently enrolled population, specifically increased tablet usage with higher levels of education. The results did not answer this research question, but we can visually see the most technological usage coming from the currently enrolled population who had higher levels of formal education.

The second research question examined technological use based on willingness to learn. Figure 3 clearly shows the older adults who are currently enrolled in educational courses are more willing to take additional courses. The results did not answer the research question but the reasons can be based on other factors. The people who are

not enrolled in any courses may have other reasons that more than half of them said they are not willing to take an educational course. In a case study, older adults used technology when it was on their terms and only when it matched their social and physical health status (Bailey & Sheehan, 2009). Thus, the unwillingness can be due to physical, mental, or other problems one faces in later age. There was no significance found when looking at both populations overall technological use based on willingness to learn.

The final research question examined technophobia based on technological usage. Both populations had the same exact percentage of people who felt fearful when introduced to new technology. With such different population sizes, this surprised me. There was no significance found for either population through regression that technological usage is affected by willingness to learn. The research question was not answered by the results of the data.

There were not any significant findings that were substantial to answer my research questions. This study would have benefited with a bigger sample size. It would allow more significant extrapolations from the data. I was able to speak with a lot of the elderly not enrolled in educational courses, and their biggest complaint was how fast technology evolves. Li and Perkins note that the fast pace of technological growth that the older population would get a benefit out of it if they were included and informed (2007). A few solutions to this could be free classes, a special line of older adult technology products, or community involvement. If older adults are not willing to take these classes, other measures need to be put in place. These alternatives could feature more one-on-one interaction and at-home services. Bailey and Sheehan demonstrated that for older adults to be willing to learn new technology there needs to be value seen in it (2009). It could possibly be that people who are not willing to take educational courses on technology believe there is not any value in learning it. Future research may want to answer if older adults value technology. This would allow a researcher to focus on the population that sees value in it and answer questions about how to encourage the elderly population to use mobile technology.

References

Bailey, C., & Sheehan, C. (April 01, 2009). Technology, older persons' perspectives and the anthropological ethnographic lens. *Alter - European Journal of Disability Research, Revue Européen De Recherche Sur Le Handicap,* 3, 2, 96-109.

Barbosa, B., Amaro, F. (2012).). Too old for technology? How the elderly of Lisbon use and perceive ICT. *The Journal of Community Informatics,* Vol. 8. http://ci-journal.net/index.php/ciej/article/view/800/904

Boni, L. Y., & Perkins, A. (August 01, 2007). The impact of technological developments on the daily life of the elderly. *Technology in Society,* 29, 3, 361-368.

Buse, C. (January 01, 2009). When you retire, does everything become leisure? Information and communication technology use and the work/leisure boundary in retirement. *New Media & Society,* 11, 7, 1143-1161.

Casado-Muñoz, R., Lezcano, F., & Rodríguez-Conde, M.-J. (July 01, 2015). Active ageing and access to technology: An evolving empirical study. *Comunicar,* 23, 45.)

Cumming, E., & Henry, W. E. (1961). Growing old, the process of disengagement. Basic Books.

Demps, K., Zorondo-Rodríguez, F., García, C., & Reyes-García, V. (2012). Social learning across the life cycle: cultural knowledge acquisition for honey collection among the Jenu Kuruba, India. *Evolution and Human Behavior, 33*(5), 460-470.

DiMaggio, P., Hargittai, E., Neuman, W. R., & Robinson, J. P. (August 01, 2001). Social implications of the internet. *Annual Review of Sociology,* 27, 1, 307-336.

Henrich, J., & McElreath, R. (2003). The evolution of cultural evolution. *Evolutionary Anthropology: Issues, News, and Reviews, 12*(3), 123-135.

Lin, C. C., Wen-hui, T., & Feng-Yang, K. (2012). "Mommy wants to learn the computer": How middle-aged and elderly women in Taiwan learn ICT through social support. *Adult Education Quarterly, 62*(1), 73-90.

Morris, J., Mueller, J., & Jones, M. (2010). Tomorrow's elders with disabilities: what the wireless industry needs to know. *Journal Of Engineering Design, 21*(2/3), 131-146.

Nasser, E. C. (2005). Recovery from major depression: the role of support from family, friends, and spiritual beliefs. *Acta Psychiatrica Scandinavica, 111*(2), 125-132.

Pew Research Center. (2015). Retrieved from: Pewresearch.org

Selwyn, N. (January 01, 2004). The information aged: A qualitative study of older adults' use of information and communications technology. *Journal of Aging Studies,* 18, 4, 369-384.

Touhy T. & Jett K. (2012). Ebersole and Hess': Toward healthy aging: Human needs and nursing response. St. Louis, Missouri: Mosby, Inc. (Touhy & Jett, 2012)

Wilson, S. M., & Leighton C. Peterson. (2002). The anthropology of online communities. *Annual Review of Anthropology,* 31, 449–467. Retrieved from http://www.jstor.org/stable/4132888

Wong, Y., Chen, H., Lee, V., Fung, J., & Law, C. (2014). Empowerment of senior citizens via the learning of information and communication technology. *Ageing International, 39*(2), 144-162. doi:10.1007/s12126-013-9185-4