

Examining communication technology usage among older adults with aphasia within the context of Socioemotional Selectivity Theory

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A. Dinh, J.A. Brown. Examining communication technology usage among older adults with aphasia within the context of Socioemotional Selectivity Theory. *Gerontechnology* 2019;18(4):223-230; <https://doi.org/10.4017/gt.2019.18.4.004.00> **Background** Stroke mostly occurs in adults aged 65 and above and often results in aphasia, a language disorder characterized by impaired linguistic comprehension and/or expression. Having aphasia can negatively impact one's social relationships, so identifying new means of aiding this effort is needed. According to a prominent social gerontology theory, Socioemotional Selectivity Theory (SST), as one's perceived future time lessens, one tends to focus on maintaining and nurturing emotionally meaningful relationships, rather than acquiring new ones. This shift in emotional goals may be hindered by stroke-induced aphasia. Currently, there is no study that examines the emotional needs of older adults after acquiring stroke-induced aphasia through a gerontological lens. **Research aims** The purpose of this paper is to examine the current literature on communication technology usage among older adults with and without stroke-induced aphasia. **Methods** PUBMED and Google Scholar were used to identify articles that had keywords including "older adults, communication technology, aphasia, Socioemotional Selectivity Theory, socialization." **Results** Communication technology use among the general older population has increased and is mostly for socialization. Older adults with aphasia also use communication technology for socialization; however, there is limited research on their usage. Current research suggests that there are numerous barriers as well as opportunities for communication technology usage among older adults with aphasia. **Conclusion** Using SST as a theoretical framework, communication technology has the potential to play an important role in meeting the changing emotional needs of older adults with aphasia. More studies are needed that examine the usage of different types of technology by older adults with aphasia as well as their role in meeting the changing emotional needs of these individuals.

Keywords: Older adults, technology, aphasia, communication, relationships

INTRODUCTION

As a person ages into older adulthood, it becomes more likely that they will experience a health event that influences aspects of their quality of life, such as the ability to communicate. Thus, it is important for researchers and health professionals to consider multiple resources that may aid the individual, such as the use of communication technologies. One notable health condition that influences communication is aphasia, which is most commonly caused by a stroke.

Stroke is the fifth leading cause of death within the United States (Centers for Disease Control and Prevention, CDC, 2017) and is a leading cause of death among countries in Europe (Eurostat, 2018). A stroke occurs when the blood flow

to the brain is interrupted or reduced and, as a result, brain cells begin to die. Strokes (also known as cerebrovascular disease) can occur at any age. However, they mostly occur to those over the age of 65 and typically result in hospitalization (Hall, Levant, & DeFrances, 2012). Although not everyone who experiences a stroke dies as a result of this particular health event, it is the leading cause of long-term disability (Benjamin et al., 2017).

Those who survive are likely to have some level of damage to the brain that can affect physical and cognitive-linguistic functions. One of the more common outcomes of a stroke is aphasia, which is caused by damage to the parts of the brain that control language and is characterized by impaired linguistic comprehension and/or ex-

pression (Hallowell & Chapey, 2008). Individuals with aphasia experience difficulty with understanding and/or expressing language in writing, reading, speaking, and/or listening. Although strokes are the leading cause of aphasia, other conditions such as traumatic brain injury and brain tumors can also result in aphasia (Hallowell & Chapey, 2008).

Because aphasia can severely limit effective verbal communication, it can significantly impact one's quality of life. People with aphasia tend to feel frustrated, embarrassed, inadequate, depressed, and socially isolated (Gainoti, 1997). Moreover, people with aphasia tend to have a smaller and less diverse social network than healthy adults without aphasia (Hilari & Northcutt, 2017). Relationships between spouses, or parent and adult children, or friends have been reported to be negatively affected by aphasia (Bastawrous, Gignac, Kapral, & Cameron, 2014; Brown et al., 2013; Cruice et al., 2006; Halle, Duhamel, & Le Dorze, 2011; Le Dorze et al., 2009; Le Dorze & Signori, 2010; Northcott & Hilari, 2011; Thompson & Ryan, 2009).

Studies have also demonstrated that aphasia affects aspects ranging from employment to socialization (Graham, Pereira, & Teasell, 2011; Hilari & Northcutt, 2017). It is imperative to consider the latter, as aphasia can be a catalyst for depression and social isolation, which are strongly correlated to the quality of life (Hilari & Northcutt, 2017; Starkstein & Robinson, 1988). And, because the majority of persons who have aphasia are older adults, it is critical to consider how this life-altering condition may be viewed through both a communication science and gerontological lens – all the while considering the role and significance of socialization in older adulthood.

When assessing the role of socialization in older adulthood, it is important to consider the application of a particular gerontology theory that highlights changing social needs and ensuing implications within the context of aging. Socioemotional Selectivity Theory (SST), developed by Dr. Laura Carstensen in the 1990s, has been applied to various health-related conditions such as cancer (Kuenemund et al., 2013; Mark, 2012; Pinquart et al., 2005; Pinquart & Silbereisen, 2006; Pinquart et al., 2009).

Carstensen (1995) described the theory as follows: The theory holds that similar sets of social goals operate throughout life, but that the salience of specific goals fluctuates depending on the place in the life cycle. In particular, the regulation of emotion becomes increasingly salient over the life course, while the acquisition of information, and the desire to affiliate with unfamiliar people, decreases (p. 152).

In summary, as a person's perceived future-time becomes limited, his or her goals tend to focus more on emotionally meaningful relationships, rather than acquiring or broadening his or her social network. So, as compared to members of younger populations who tend to broaden their social networks, older persons tend to prune theirs with advancing age. With that in mind, one's perception of future time is not necessarily dependent upon age-related aspects, but it can be influenced by significant health events such as cancer (Carstensen, 1995; Pinquart & Silbereisen, 2006).

One of the primary aspects of SST is the significance of nurturing and maintaining emotionally meaningful relationships. Furthermore, tending to meaningful relationships can prove challenging for persons who experience a significant health condition that limits communication, such as aphasia. Currently, no published study has been identified in that it examines how aphasia hinders the maintenance of significant relationships from the perspective of an older adult who has aphasia. Nonetheless, it is reasonable to suggest that a stroke and similar health events that result in aphasia may influence one's social network and the maintenance of meaningful relationships.

This stance is supported in a currently ongoing study being conducted by the authors. Preliminary findings suggest that not only do social networks notably change after the health event that caused aphasia but also that relationship priorities change for the adult. In short, perceived future-time is likely not just associated with increasing old age but is exasperated by a significant health event. Furthermore, this is complicated when the health event hinders communication during a time when the nurturance of significant relationships becomes increasingly important.

Scholars and communication science clinicians need to consider how communication technology can play a role to aid those older adults with aphasia (OAAs) meet their changing social needs. This is particularly important for those who work with OAAs within a rehabilitation context, such as speech-language pathologists (SLPs). Front-line clinicians such as SLPs need to be aware of the promising signs that communication technology holds in terms of designing interventions and promoting adherence. Furthermore, by being aware of SSTs application within a clinical context, clinicians may tailor therapies that incorporate communication with emotionally significant persons through the use of technological platforms.

To assess the potential role of communication technology within the lives of older adults diagnosed with aphasia, a general literature review was conducted. The primary aim was to identify

and assess research that provided foundational insight into how communication technologies may serve as an option for therapeutic intervention among OAAs. This included exploring general communication technology use among older populations and specifically honing in on studies that examine its use among OAAs.

METHODS

The authors conducted a literature review to identify reports and studies that focus on communication technology use and potential application among older adults, including those diagnosed with aphasia. Google Scholar and PUBMED were utilized as search engines and phrases used include: “older adults” and “communication technology”; “older adults” and “technology and socialization”; “aphasia” and “communication technology”; “aphasia” and “Socioemotional selectivity theory”. Potential sources were identified by reviewing abstracts and if it was found to align with the primary aim, then the sources were read in-depth.

Because there were considerably more sources that referred to the older population as a whole and communication technology, only an overview is provided within the manuscript. Thus, the findings highlight trends among the general older population within the context of communication technology followed by an overview of all identified studies focusing specifically on those technologies among persons diagnosed with aphasia. This is done to provide insight into how communication technologies may be used as a tool to promote the maintenance of important social networks and the nurturance of meaningful relationships as one’s perception of future time becomes narrowed (as supported by SST), especially when influenced by a health event that inhibits one’s ability to communicate – i.e., aphasia.

Communication technology usage among older adults

To have an understanding of how OAAs may take advantage of communication technologies to enhance and maintain emotionally significant relationships, we must first explore how and the extent to which such technologies are used among the aging population at large. This does not suggest that older populations primarily use communication technologies to nurture significant relationships, a tenet of SST. Rather, it is important to understand the extent and how older populations use communication technologies, as research has demonstrated that one of its primary uses is as a tool to support aspects of socialization (Gitlow, 2014; Vroman, Arthanat, & Lysack, 2015). Furthermore, an overview is important when considering that a proportion of this population has or will experience a health

event that may result in aphasia.

The proportion of older adults who use communication technologies has steadily increased. An example of this is reflected in a market report from the Pew Research Center (2014). Within one year, from April 2012 to April 2013, the percentage of persons age 65+ who own a mobile phone increased from 69% to 77%. Such an increase is noteworthy, as research shows that most older adults use mobile phones for communication with family and friends (Gitlow, 2014).

A similar trend was identified with Internet use among this population, as percentages gradually increased from 35% in 2008 to 53% in 2012 and then to 59% in 2013 (Pew Research Center, 2014). However, it is worth pointing out that Internet usage among older adults varies depending on the user’s age, income, and educational background. Older adults between the age of 65 and 69 who are affluent and well-educated are reported to adopt the internet at a higher rate than those who are older and have lower income and education (Pew Research Center, 2014). Approximately 68% of those in their early 70s use the internet and 47% of those between the ages of 75 and 79 participate in online activity. The percentage decreases to 37% among those aged 80 years and above. Similar trends for internet use in the US have been found by the Pew Research Center a few years later (Anderson & Perrin, 2017): 82% (aged 65-69), 75% (aged 70-74), 60% (aged 75-79) and 44% (aged 80+).

Outside of the US, studies from other countries reflect similar findings with greater internet use among younger populations as compared to older populations yet a general increase of use of internet among reported populations (Lebo, 2016)

It has also been documented that among those older adults who use the Internet, 46% of them use social networking sites (SNS), such as Facebook (Pew Research Center, 2014). The same survey also reported that SNS users are more likely to socialize with friends and family than the non-users of SNS. The 2017 report indicated that nearly half of the youngest of those older populations (aged 65-69) use SSN as compared to the oldest age cohort (aged 80+) – 47% vs. 17% (Anderson & Perrin, 2017). Although a smaller percentage of the oldest age cohort uses SSN, they are more likely to use the internet for social connectivity as compared to information seeking. This is notable to consider within the context of SST, as it suggests a potential correlation with the increasing importance of nurturing meaningful relationships. In addition to mobile phones and SNS, email has also been an important communication tool for older adults. Ac-

Communication technology usage among older adults

According to a Pew survey in 2010, 89% of people aged 65 and above use email.

An assessment of communication technology use among 198 older adults indicated that one of the primary uses was for family and social communication and high levels of use were associated with being physically and emotionally independent (Vroman, Arthanat, & Lysack, 2015). One particular study highlighted the significance of Internet use as a tool for socialization in old age. Russell, Campbell, and Hughes (2008) conducted a two-stage qualitative study to explore the relationship between Internet communication and access to social capital in later life. Social capital refers to one's social ties and social support (Choi & DiNitto, 2013). The first stage consisted of an electronic survey completed by 154 Australian Internet users aged 55 years and above. More than half of the participants were 65 years old or older.

According to the survey results, email communication with friends and relatives was reported to be a primary reason for Internet use by most of the participants. More importantly, more than three-quarters of the participants (78.7%) reported that using the Internet had made them feel more satisfied with their level of contact with family and friends. Participants were invited to provide more detailed responses via email or to participate in online group interviews or stage 2 of the study. Thirty people were included in stage 2, and no information related to their age was reported. Stage 2 participants emphasized that online communication did not replace face-to-face contacts; however, it allowed them to "maintain geographically dispersed connections" (Russell et al., 2008, p. 80).

As evidenced by this finding, an 80-year-old participant shared that her social network had expanded because of her use of the Internet. She discovered her relatives through the Internet, which led to them meeting in person at a family reunion. Another noteworthy finding within this study is that some participants reported that the use of email had enhanced the quality of their relationships with whom they communicated. Specifically, it was reported that this enhanced their face-to-face communication, as they talked about information previously exchanged via emails. Overall, the study showed that Internet communication, specifically via email, served as a supplementary tool to maintain and nurture important relationships in the lives of aging adults.

More recently, Choi and DiNitto (2013) were the first to identify the association between varied Internet activities and health needs, psychological capital, and social capital among older adults

(age 65 years old and older) ($n = 6680$) in the United States. The researchers divided Internet activity into three categories: (1) emails and messaging, (2) shopping, paying bills, and banking, and (3) health-related searches and activities. Although most participants reported engaging in a variety of Internet activities, emailing and messaging was the most common activity (86% of participants). One notable finding from the study is the "synergistic relationship" between Internet use and the older adult participants' social capital. The authors suggested that when older adults with little social capital use the Internet, their social capital may increase because Internet use can promote and enhance their social ties and support.

These findings can be interpreted and appreciated from the SST perspective. As older adults perceive a decrease in their future time, there is an increased need to maintain (and even improve) their relationship with loved ones, which may be achieved via communication technologies. Furthermore, as people become increasingly geographically distant from their family and friends (e.g. due to relocations associated with work or school), communication technologies, such as mobile phones and computers, become an important tool in bridging that gap (Russell et al., 2008).

Nonetheless, despite the increasing usage of technology among older adult populations, several barriers still exist that hinder technology use. This includes issues related to an aging individual's physical and cognitive capabilities to utilize a device, as well as his or her level of education (Gitlow, 2014; Pew Research Center, 2014). In addition, age-related declines in vision, hearing, fine motor skills, and memory likely make it difficult for older adults to use technology effectively (Pew Research Center, 2014).

Communication technology for older adults with aphasia

Although older adults with normative aging issues face challenges in utilizing technology in everyday life, OAAs face even greater barriers due to aspects such as high linguistic demands and complex interface design constrain participation. Having a language deficit, no matter how mild or severe, will most likely negatively influence some aspects of communication technology interaction, which would also hinder the potential use or maintenance of social networks. Moreover, many people with aphasia have concomitant visual and motor impairments that likely make it much harder for them to use technology (American Speech-Language-Hearing Association, ASHA). Nonetheless, having these cognitive, linguistic, and physical challenges do not diminish the need to use technology to maintain and nurture impor-

tant relationships. Rather, we propose that from the SST perspective, the desire to use, or recognition of technology as a catalyst to stay connected with loved ones may increase for those who are already users of these technologies.

The aforementioned studies have already provided evidence that older persons who have a history of use with communication technologies are more likely to use it in later life. With growing proportions of tech-savvy adults who are aging into older adulthood, this is notable in terms of potential therapeutic applications should the need arise.

There are not many studies that examine multiple communication technology platforms within the context of aphasia, yet there has been a variety of applications. Currently, alternative and augmentative communication (AAC) is “the most established form of computer technology used in the management of language disorders” (Brandenburg, Worrall, Rodriguez, & Copland, 2013, p. 448). High-tech AAC devices are designed to “supplement or replace impaired spoken language in everyday life” (Brandenburg et al., 2013, p. 449). Linebarger, Romania, Fink, Bartlett, & Schwartz (2008) reported that the use of AAC among people with aphasia is relatively low. AAC devices are typically used by persons with severe aphasia; however, the use of AAC has not consistently been shown to generalize to effective communication in everyday life (Jacobs, Drew, Ogletree, & Pierce, 2004). It is unclear whether the reason was usability issues or users’ perceptions about technology. More research is needed related to the use of AAC among people with severe aphasia. Nonetheless, it appears that the focus of AAC is basic daily communication for those with severe spoken language impairment. At this point in time, limited evidence related to the role of AAC in helping older adults or people with severe aphasia to maintain and nurture important relationships have surfaced.

On the other hand, persons with mild or moderate aphasia may still be able to use high-level technology, such as mobile phones and emails, to maintain and nurture important relationships in their lives. Greig, Harper, Hirst, Howe, and Davidson (2008) explored the barriers and facilitators to the usage of mobile phones among persons with aphasia using semi-structured interviews and structured observations. Six adults, two of who were from 60-70 years old, participated in the study. They identified barriers related to design and features including smallness of buttons, single-button having multiple functions, too many features, as well as barriers related to written support and training. They also identified some facilitators related to design and writing support and training. However, not all barriers

and facilitators were present in both the interviews and observations. Another study also suggested that smart mobile devices show promise as a platform for communication with this population (Moffatt, Pourshahid, & Baecker, 2017). In addition, AphasiaWeb is currently the only social networking application that specifically targets improving social interaction for people with aphasia (Buhr, Hoepner, Miller, & Johnson, 2017). However, it is still in the evaluation phase.

Computer use is a challenge for some older persons and when considering aphasia as an added variable, its use can be less feasible despite potential benefits such as increased methods for communication. Kelly and colleagues (2015) evaluated a computer training course for adults with aphasia. Although results post-course suggested that the program improved skills for attendees, follow-up interviews indicated that skills declined overtime without ongoing support. Nonetheless, the authors found that these skills aided to enhance communication options for social engagement.

One of the more salient studies that examined OAAs and communication technologies was conducted by Menger, Morris, and Salis (2019). Stemming from an earlier study (Menger, Morris, & Salis, 2016), the authors explored internet use among OAAs and older adults without aphasia by employing face-to-face supported questionnaire. They found that although age was a stronger predictor of whether or not they would use the internet (as compared to aphasia). Nonetheless, aphasia contributed negatively to some forms of communication technology, such as email and messaging services.

When considering that OAAs are at risk for depression, it is critical to consider how online options, such as e-Mental Health programs, serve as a tool (Clunne, Ryan, Hill, Brandenburg, & Kneebone, 2018). The authors assessed eight web-based programs that are available to the general public and only one scored in a range that merited further examination. When tested by persons with aphasia, the program was deemed unsuitable.

Because health events such as a stroke can impair the use of one’s hand(s) and can make typing difficult. Thus, social media applications that focus on posting images (as opposed to typing content) may be an attractive option for OAAs. Alper and Haller (2017) explored this when they interviewed Denise McCall, program director for the Snyder Center for Aphasia Life Enhancement (SCALE). In particular, they learned that the image-based application Pinterest can be beneficial because the individual can select which photos to use to com-

municate an idea and can organize their thoughts around themes. However, another image-based application, Snapchat, did not demonstrate as much promise among adults with aphasia (Baier, Hoepner, & Sather, 2018). Although the participants were provided training, an aphasia-friendly reference manual, and ongoing technical support, post-trial interviews indicated dissatisfaction with the application as a social networking tool. Nonetheless, the authors believe that there is potential for this mode of communication technology with the aphasia population.

DISCUSSION

A review of the literature indicated that communication technology use among the older population has been increasing and is used for a variety of purposes including socialization. Furthermore, statistics indicate that members of this population will indeed experience a stroke that will result in aphasia, which will likely hinder their ability to communicate effectively. To provide insight into studies that focus on some mode of communication technology use by OAAs, the literature review indicates that there are numerous barriers as well as opportunities. However, there is a dearth of such studies that merits attention so that the potential use of communication technologies for this population may be better understood and utilized as appropriate.

Although some older adults (in general) experience challenges with select communication technologies, the literature review suggested that OAAs may be more likely to experience difficulty with learning how to use a select platform and/or using it due to issues that are exasperated by the aphasia. For example, the interface of a platform may be more difficult to manipulate if the aphasic condition influences hand control and movement. Overall, the review suggests that aspects such as the OAAs' knowledge and confidence with the use of the technology coupled with the extent of the severity of aphasia influence their propensity to use it.

SST posits that as a person's sense of future-time narrows, there is a tendency to focus on increasing efforts on meaningful relationships. This means that an adult may employ various strategies to prune superfluous relationships within their social network as well as hone in on nurturing those that are more important. SST research

also suggests that this may become amplified in the context of a significant health event or presence of a notable health condition, such as aphasia. When communication becomes compromised (i.e., aphasia), it may further challenge the adult to nurture those meaningful relationships. However, the literature suggests that communication technology may be an option if the adult understands how to use it and if the design is accommodating to their functional limitations.

When applying this within a rehabilitative context, this is valuable information for those who work with OAAs such as speech-language pathologists (SLPs). SLPs should be sensitive to the possible changing social needs in their patients with aphasia as proposed by SST, as well as the challenges faced by their patients in meeting those needs. Furthermore, SLPs need to be aware of how communication technology may be incorporated into individual treatment plans based on the adult's socialization goals and comfort with select platforms. By doing so, it may increase therapeutic compliance but also provide an incentive to the adult if using that mode of communication may aid their effort to socialize with select persons. This does not mean that communication technology should be incorporated into all treatment plans for OAAs but it should be considered.

CONCLUSION

As the older adult population continues to increase, so too will the proportion of adults who will be at risk for stroke that may result in aphasia. Although few identified studies examined communication technology use among OAAs, it will likely gain traction as technology becomes more sophisticated. Plus, future cohorts of older adults will likely be more technologically savvy and potentially more dependent upon communication technology for social capital than today's current older generations of older adults. Thus, we suggest that SLPs will have to become increasingly aware of unique means to incorporate communication technology as part of therapeutic interventions for OAAs (as appropriate).

Additional research is necessary to better examine not only how communication technology (and training) can be improved and used as a tool for OAAs but also how it can be used to better nurture significant relationships.

References

- Alper, M. & Haller, B. "Social Media Use and Mediated Sociality Among Individuals with Communication Disabilities in the Digital Age." In K. Ellis & M. Kent (Eds.), *Disability and Social Media: Global Perspectives* (pp. 133-145). London, UK: Routledge, 2017.
- American Speech-Language-Hearing Association, ASHA. Aphasia. Retrieved on April 27, 2015 from <http://www.asha.org/public/speech/disorders/Aphasia/>
- Anderson, M. & Perrin, A. (2017). Tech adoption climbs among older adults. Retrieved from Pew

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- Research Center website: <https://www.pewinternet.org/2017/05/17/tech-adoption-climbs-among-older-adults/>
- Baier, C. K., Hoepner, J. K., & Sather, T. W. (2018). Exploring Snapchat as a dynamic capture tool for social networking in persons with aphasia. *Aphasiology*, 32(11), 1336-1359. <https://doi.org/10.1080/02687038.2017.1409870>
- Bastawrous, M., Gignac, M. A., Kapral, M. K., & Cameron, J. I. (2014). Daughters providing poststroke care: perspectives on the parent-child relationship and well-being. *Qualitative Health Research*, 24(11), 1527-1539. <https://doi.org/10.1177/1049732314548689>
- Benjamin, E.J., Blaha, M.J., Chiuve, S.E., Cushman, M., Das, S.R., Deo, R., Muntner, P. (2017). Correction to: Heart Disease and Stroke Statistics—2017 Update: A Report From the American Heart Association. *Circulation*, 135(10). <https://doi.org/10.1161/cir.0000000000000491>
- Brandenburg, C., Worrall, L., Rodriguez, A. D., Copland, D. (2013). Mobile computing technology and aphasia: An integrated review of accessibility and potential uses. *Aphasiology*, 27(4), 444-461. <https://doi.org/10.1080/02687038.2013.772293>
- Brown, K., Davidson, B., Worrall, L. E., & Howe, T. (2013). "Making a good time": The role of friendship in living successfully with aphasia. *International Journal of Speech-Language Pathology*, 15(2), 165-175. <https://doi.org/10.3109/17549507.2012.69281>
- Buhr, H. R., Hoepner, J. K., Miller, H., & Johnson, C. (2017). AphasiaWeb: development and evaluation of an aphasia-friendly social networking application. *Aphasiology*, 31(9), 999-1020. <https://doi.org/10.1080/02687038.2016.1232361>
- Carstensen, L. L. (1995). Evidence for a life-span theory of socioemotional selectivity. *Current directions in Psychological science*, 4(5), 151-156.
- Centers for Disease Control and Prevention, CDC. (2017, March 17). Leading cause of death. Retrieved November 9, 2018, from <https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>
- Choi, N., & DiNitto, D. (2013). Internet use among older adults: association with health needs, psychological capital, and social capital. *Journal of Medical Internet Research*, 15(5), e97.
- Clunne, S. J., Ryan, B. J., Hill, A. J., Brandenburg, C., & Kneebone, I. (2018). Accessibility and applicability of currently available e-mental health programs for depression for people with poststroke aphasia: Scoping review. *Journal of medical Internet research*, 20(12), e291.
- Cruice, M., Worrall, L., & Hickson, L. (2006). Quantifying aphasic people's social lives in the context of non-aphasic peers. *Aphasiology*, 20(12), 1210-1225. <https://doi.org/10.1080/02687030600790136>
- Eurostat. Causes and occurrence of deaths in the EU. (2018, March 14). Retrieved November 9, 2018, from <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20180314-1>
- Gainotti, G. (1997). Emotional, psychological and psychosocial problems of aphasic patients: An introduction. *Aphasiology*, 11(7), 635-650. <https://doi.org/10.1080/02687039708249412>
- Gitlow, L. (2014). Technology use by older adults and barriers to using technology. *Physical & Occupational Therapy in Geriatrics*, 32(3), 271-280. <https://doi.org/10.3109/02703181.2014.946640>
- Graham, J. R., Pereira, S., & Teasell, R. (2011). Aphasia and return to work in younger stroke survivors. *Aphasiology*, 25(8), 952-960. <https://doi.org/10.1080/02687038.2011.563861>
- Greig, C-A., Harper, R., Hirst, T., Howe, T., & Davidson, B. (2008). Barriers and facilitators to mobile phone use for people with aphasia. *Topics in Stroke and Rehabilitation*, 15(4), 307-324. <https://doi.org/10.1310/tsr1504-307>
- Hall, M. J., Levant, S., & DeFrances, C. J. (2012). Hospitalization for stroke in U.S. hospitals, 1989-2009. *NCHS Data Brief*, (95):1-8.
- Halle, M-C., Duhamel, F., & Le Dorze, G. (2011). The daughter-mother relationship in the presence of aphasia: How daughters view changes over the first year poststroke. *Qualitative Health Research*, 21(4), 549-562. <https://doi.org/10.1177/1049732310391274>
- Hallowell, B., & Chapey, R. (2008). Introduction to language intervention strategies in adult aphasia. In R. Chapey (Ed.), *Language intervention strategies in aphasia and related communication disorders* (5th ed., pp. 3-19).
- Hilari, K., & Northcott, S. (2017). "Struggling to stay connected": comparing the social relationships of healthy older people and people with stroke and aphasia. *Aphasiology*, 31(6), 674-687. <https://doi.org/10.1080/02687038.2016.1218436>
- Jacobs, B., Drew, R., Ogletree, B. T., & Pierce, K. (2004). Augmentative and Alternative Communication (AAC) for adults with severe aphasia: where we stand and how we can go further. *Disability and Rehabilitation*, 26(21/22), 1231-1240. <https://doi.org/10.1080/09638280412331280244>
- Kauhanen, M. L., Korpelainen, J. T., Hiltunen, P., Maatta, R., Mononen, H., Brusin, E., Sotaniemi, K. A., & Myllyla, V. V. (2000). Aphasia, depression, and non-verbal cognitive impairment in ischemic stroke. *Cerebrovascular Diseases*, 10, 455-461. <https://doi.org/10.1159/000016107>
- Kelly, H., Kennedy, F., Britton, H., McGuire, G., & Law, J. (2015). Narrowing the "digital divide"—facilitating access to computer technology to enhance the lives of those with aphasia: a feasibility study. *Aphasiology*, 30(2-3), 133-163. <https://doi.org/10.1080/02687038.2015.1077926>
- Kuenemund, A., Zwick, S., Doering, B. K., Conrad, N., Rief, W., & Exner, C. (2013). Decline in attainability of communion and agency life goals over 2 years following acquired brain injury and the impact on subjective well-being. *Neuropsychological rehabilitation*, 23(5), 678-697. <https://doi.org/10.1080/09602011.2013.801779>
- Le Dorze, G., Tremblay, V., & Croteau, C. (2009). A qualitative longitudinal case study of a daughter's adaptation process to her father's aphasia and stroke. *Aphasiology*, 23(4), 483-502. <https://doi.org/10.1080/02687030801890909>
- Le Dorze, G. & Signori, F-H., (2010). Needs, barriers and facilitators experienced by spouses

- of people with aphasia. *Disability and Rehabilitation*, 32(13), 1073-1087. <https://doi.org/10.3109/09638280903374121>
- Lebo, H. (2016). The 2016 digital future report: Surveying the digital future, year fourteen. Retrieved from Digital Center website: <https://www.digitalcenter.org/wp-content/uploads/2013/06/2016-Digital-Future-Report.pdf>
- Mark, R. (2012). Understanding the individual with Alzheimer's disease: Can socioemotional selectivity theory guide us? *Advances in Alzheimer's Disease*, 1(3), 77-86. <https://doi.org/10.4236/aad.2012.13010>
- Menger, F., Morris, J., & Salis, C. (2016). Aphasia in an internet age: Wider perspective on digital inclusion. *Aphasiology*, 30(2-3), 112-132. <https://doi.org/10.1080/02687038.2015.1109050>
- Menger, F., Morris, J., & Salis, C. (2019). The impact of aphasia on Internet and technology use. *Disability and Rehabilitation*, 1-11. <https://doi.org/10.1080/09638288.2079.1580320>
- Moffatt, K., Pourshahid, G., & Baecker, R. M. (2017). Augmentative and alternative communication devices for aphasia: the emerging role of "smart" mobile devices. *Universal Access in the Information Society*, 16(1), 115-128. <https://doi.org/10.1007/s10209-015-0428-x>
- Northcott, S., & Hilari, K. (2011). Why do people lose their friends after a stroke? *International Journal of Language and Communication Disorders*, 46, 524 - 534. <https://doi.org/10.1111/j.1460-6984.2011.00079.x>
- Smith, A. (2014). Older adults and technology use. Retrieved from Pew Research Center website: <https://www.pewinternet.org/2014/04/03/older-adults-and-technology-use/>
- Pinquart, M., Nixdorf-Hanchen, J. C., & Silbereisen, R. K. (2005). Associations of age and cancer with individual goal commitment. *Applied Developmental Science*, 9(2), 54-66. https://doi.org/10.1207/s1532480xads0902_2
- Pinquart, M., & Silbereisen, R. K. (2006). Socioemotional selectivity in cancer patients. *Psychology and aging*, 21(2), 419. <https://doi.org/10.1037/0882-7974.21.2.419>
- Pinquart, M., Silbereisen, R. K., & Fröhlich, C. (2009). Life goals and purpose in life in cancer patients. *Supportive Care in Cancer*, 17(3), 253-259. <https://doi.org/10.1007/s00520-008-0450-0>
- Russell, C., Campbell, A., & Hughes, I. (2008). Ageing, social capital and the Internet: Findings from an exploratory study of Australian 'silver surfers'. *Australasian Journal of Ageing*, 27(2), 78-82. <https://doi.org/10.1111/j.1741-6612.2008.00284.x>
- Starkstein, S. E., & Robinson, R. G. (1988). Aphasia and depression. *Aphasiology*, 2(1), 1-19.
- Thompson, H. S. & Ryan, A. (2009). The impact of stroke consequences on spousal relationships from the perspective of the person with stroke. *Journal of Clinical Nursing*, 18, 1803-1811. <https://doi.org/10.1111/j.1365-2702.2008.02694.x>
- Vroman, K. G., Arthanat, S., & Lysack, C. (2015). "Who over 65 is online?" Older adults' dispositions toward information communication technology. *Computers in Human Behavior*, 43, 156-166. <https://doi.org/10.1016/j.chb.2014.10.018>