

# A Pilot Exploration of Snapchat as an Aphasia-Friendly Social Exchange Technology at an Aphasia Camp

Jerry K. Hoepner<sup>1\*</sup>, Carissa K. Baier<sup>1</sup>, Thomas W. Sather<sup>1,2</sup>, Mary Beth Clark<sup>2</sup>

<sup>1</sup>University of Wisconsin - Eau Claire, Eau Claire, United States; <sup>2</sup>Mayo Clinic Health Systems - Eau Claire, Eau Claire, United States

**Purpose:** The present pilot investigation sought to examine the potential of Snapchat to be used as a social exchange tool and to identify the types of information individuals with aphasia would share through this picture-based, multi-modality application.

**Methods:** Thirteen individuals with aphasia were involved in a two-day trial of Snapchat at an aphasia camp given a group training and ongoing access to volunteer support. Quantitative measures included frequency counts and use of text and/or drawing functions. Qualitative outcomes used open and axial coding methods to characterize communication intent. These were triangulated through multiple coders, multiple rounds of consensus coding, and three coding schemes.

**Results:** Participants successfully used the Snapchat application to generate 174 total posts, all of which used images and some included text, drawing, or multiple modalities. Three coding schemes emerged, which characterized the intent of post exchanges.

**Conclusions:** Snapchat appears to be a feasible tool to foster social exchange among individuals with aphasia, when given guided, incremental learning, and troubleshooting supports. Individuals with aphasia, given no constraints on what to post, demonstrated their communication intent through the images of people and interactions they exchanged. Availability of scaffolded, incremental supports and ongoing troubleshooting for exploring this picture-based, social networking application appears to be important to successful use. Individuals with aphasia can share what matters to them through images, augmented with text, drawings, or other multi-modal inputs.

**Keywords:** aphasia, social networking, picture-based communication, technology, aphasia camp



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**Correspondence:**  
 Jerry K. Hoepner

University of Wisconsin - Eau Claire, 105  
 Garfield Avenue, Eau Claire, United  
 States  
 Tel: +715-836-3980  
 Fax: +715-836-4185  
 E-mail: hoepnejk@uwec.edu

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 Language Pathologists

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## INTRODUCTION

The rise of social exchange applications such as Facebook, Twitter, Instagram, blogs, and others has expanded the opportunities for individuals to traverse former barriers of time, geographical locations, and even physical impairments to some extent. Individuals with aphasia have expressed a desire to engage in social interactions using internet and mobile technologies [1]. Unfortunately, many of these applications lack the aphasia-friendly interface to foster effective exchange [2,3]. Visually and linguistically complex layouts typically found in readily available applications often compromise effective usage of the social networking application for individuals with aphasia due to

comprehension and expression challenges.

Physical, attitudinal, and communication impairments place individuals with aphasia at risk for social isolation [4-6]. A decrease in friendships and a smaller social network are often the result [4,7-10]. In addition to dwindling social networks, individuals with aphasia experience reduced diversity of contacts, contact frequency, and perceptions of reduced interaction quality [10,11]. While they typically maintain or increase contact with their children, loss of friends and acquaintances [10] is common. In fact, Hilari and Northcott [9] state that 30% of individuals with aphasia in their study reported no remaining friends. Meaningful and satisfying interactions are desired by individuals with aphasia [11]. Specifically, they desire to be involved, independent rather than burdensome, comprehend complex interactions, be active in their community and/or help others, and be seen as competent [11].

Acknowledging that loss of identity may be at the root of social isolation, it is important to minimize the potential barriers that restrict sharing of one's identity [12,13]. These restrictions can include physical impairments, geographical or mobility-based isolation, communication impairments, and attitudinal barriers placed by self or others. By emphasizing and facilitating opportunities for scaffolded interactions in personally relevant environments and social activities, social intervention approaches attempt to foster participation and reduce isolation [6,8]. Social exchange opportunities have expanded with the advent of internet-based social exchange technologies. Bridging the gap between opportunities and interface barriers requires the development of aphasia-friendly platforms and/or modifications of universally available tools.

### **What factors are needed for accessible interface?**

With the emergence of internet-based resources, several researchers have examined accessibility of internet materials for individuals with aphasia [2,3,14-16]. Modifications to written materials can be drawn from Egan and Worrall's [14] web development guidelines, along with several studies about modifying printed text [2,17-20]. Suggested alterations include: simplified instructions, use of commonly used words, larger and simplified font, bulleting and numbering, step-by-step instructions, increased white space, unambiguous graphics, left justified layout, and using color, different fonts, bolding, italics, distinctive headings, or borders for emphasis.

Gao and colleagues [21] offer an excellent review of sensory, cognitive, and motor considerations for designing accessible social network interface for older adults. Sensory adaptations

identified include: (a) larger font, icons, and buttons; (b) use of simple, sans serif type font; (c) spacing; (d) placing important information at the center of the screen; (e) color and contrast considerations; (f) audio outputs in low-middle frequency ranges; and (g) re-auditorization of speech/audio captioning. Modifications designed to scaffold cognition include: (a) simplifying text, reducing successive operations to access functions, and simplifying menus to reduce demands on working memory; (b) avoiding moving menus or expandable menus; (c) minimizing irrelevant information and design complexity; and (d) avoiding interface that requires continuous scanning. Adaptations to support motoric access include: (a) avoiding use of moving targets; (b) lack of rapid and repetitive movement demands; and (c) minimizing use of scrollbars. Although these adaptations were intended for older adults, these principles parallel factors identified by Egan and colleagues [14] to create aphasia-friendly printed and web-based visuals. Further, many adults with aphasia are young-old (age 50-74 years) or old-old (age 75-89 years) and such adaptations may be helpful [22] given both age and language abilities. Aphasia-friendly social exchange platforms have been explored as a way to connect individuals with aphasia with each other. Fotiadou and colleagues [23] examined blog narratives generated by individuals with aphasia, which identified a desire to discuss the challenges of living with aphasia and other post-stroke challenges. While the blogs did not generate reciprocal responses, they served as a forum for individuals with aphasia to share their perspectives on living with aphasia. Several aspects were discussed, including the impact of aphasia on relationships with family and friends, a reduction in breadth of social network, reaction of others to their stroke and aphasia, and the support they received. Individuals with aphasia identified a desire to be part of a broader community of individuals with aphasia for support. They also expressed the emotional value of sharing their experience with others and a related feeling of connectedness to others.

Altered interface can scaffold exchange of mundane-everyday experiences, facilitate sharing of identity, provide a forum to discuss living with aphasia, and foster a sense of community [23-25]. Aphasia-friendly interface can include the provision of multiple modalities to support comprehension and expression for exchange. Following a participatory action research design [26], Buhr and colleagues developed AphasiasWeb in order to provide a visually and linguistically simplified interface. AphasiasWeb is a social networking application, designed to facilitate interactions between individuals with

aphasia. The interface was intended to parallel elements of universal social networking applications like Facebook, while reducing complexity to scaffold interactions. Modifications also included the ability to post images taken in-the-moment or previously-stored, as a way to scaffold social exchange. Picture-initiated posts were more prominent than text-initiated posts and yielded more response-posts. Participants also identified this modality of exchange as a preferred way to initiate interactions. The post-trial focus group interview revealed several positive outcomes, while providing constructive feedback for future modifications. Among desired elements were an appreciation of the visually and linguistically simplified interface, value of the ability to interact with other individuals with aphasia, and an appreciation of multiple exchange modalities. While the participants valued the ability to exchange everything from mundane-everyday chat, to sharing of experiences that represent identity, and opportunities for sharing their experience of living with aphasia, they also voiced a clear desire to use more universally accessible social exchange tools to connect with others without aphasia (e.g., family and friends). Among their other suggestions were inclusion of video capabilities, text-to-speech (i.e., reauditorization), and speech-to-text capabilities [24,25].

Recognizing that modified access through privacy-controlled tools such as blogs and applications like AphasiaWeb limit social exchange to interactions with other individuals with aphasia, there is a need to consider more universal social network platforms (e.g., Facebook, Twitter, Instagram, Snapchat, etc.). Given findings from Buhr and colleagues [24,25] that identified picture-initiated exchanges as an effective and preferred means of exchange, investigators sought to pilot the use of Snapchat, a picture-exchange social networking platform.

Participant-generated photography has been identified as a way to augment other forms of expression [27,28]. Specifically, participant-generated photography can provide individuals with aphasia a way to convey concepts that are difficult to explain verbally [27,28]. Miller and Happell [29] also identified participant-generated photography as a way to support expression of abstract concepts.

Evidence for photo-initiated social networking exchanges [24,25] and participant-generated photography [27-29] suggests that Snapchat may be a good choice for a universal social networking application. The principles of accessible social networking interface [2,14,21] align with elements of Snapchat design. These include placement of important information at the center of the screen, lack of rapid and repeti-

tive movement demands, no use of scrollbars, simple operations to access functions, relatively simple menus, limited irrelevant information, limited design complexity, and limited need for scanning [21]. The authors wish to note that design complexity has increased in Snapchat app updates since the relatively streamlined app version used in this pilot. This pilot was conducted at the Chippewa Valley Aphasia Camp, an annual, weekend-long experience that takes place in the rustic context of a YMCA camp facility in western Wisconsin.

Aphasia camps provide opportunities for individuals with aphasia and their close partners to engage in meaningful activities within a supportive environment [30,31]. Camps provide an aphasia-friendly context intended to support communication, interaction, and participation. The number of extended-weekend, residential aphasia camps is growing across North America including locations in Oregon, Wisconsin, Maine, Nova Scotia, Ontario, Alberta, and British Columbia. Following the Life Participation Approach to Aphasia (LPAA) model [32], the Chippewa Valley Aphasia Camp provides opportunities to participate in self-selected, personally relevant activities. Sessions include activities such as woodworking, crafts, art, adaptive golf, adaptive archery, adaptive biking, adaptive fishing, boating, canoeing, technology, music, campfires, and large group activities. The camp staff includes speech-language pathologists, occupational therapists, physical therapists, nurses and trained undergraduate and graduate students.

The present pilot investigation sought to examine the potential of Snapchat as a multi-modality social exchange tool for individuals with aphasia at an aphasia camp. The primary intent was to identify the type of information individuals with aphasia would exchange, along with the feasibility of using this application for exchanges by individuals with aphasia.

## METHODS

### Participants

Every individual with aphasia that attended the Chippewa Valley Aphasia Camp in the fall of 2014 (n=20) was given the option to participate in the pilot study by using Snapchat (IRB protocol number 38452015). This included 9 females and 11 males, age range of 23-82 years (mean = 58.24 years). There were no restrictions dependent on age, gender, or type or severity of aphasia. Multiple descriptors were utilized to describe each individual's communication status. Following camp, three speech-language pathologists (the 1st, 3rd, and 4th au-

thors) with a combined 80 years of clinical and community aphasia experience discussed each participant's overall communication. Based on each clinician's interactions and experiences with the participant at camp, consensus was reached for each of the three measures used. The Adult Functional Communication Measures (FCM) of Spoken Language Expression and Comprehension were used to characterize expressive and receptive language [33]. Communicator type was identified

utilizing descriptors and characteristics as outlined by Lasker, Garrett, and Fox [34]. Finally, aphasia type and severity were identified using commonly established criteria. See Table 1 for participant demographics, distribution of participants who contributed, and linguistic-communication status.

Of this group 13/20, including 6 females and 7 males, actively engaged in using the Snapchat app. Note that all campers who desired to use the application did so, with one excep-

**Table 1.** Participant demographic, social, and linguistic status

#	Age	Gender	Relationship	Used Snapchat at camp	Desired to use Snapchat	NOMS FCM scores	Communicator Type	Aphasia Severity & Type
P1	58	F	Married, lives with spouse	Yes	Yes	Comp-4 Exp-2	Stored message	Global
P2	55	F	Married, lives with spouse	Yes	Yes	Comp-5 Exp-4	Stored message	Moderate-severe non-fluent
P3	72	F	Single, lives alone	Yes	Yes	Comp-6 Exp-7	Nonuser	Mild anomia
P4	35	F	Single, lives next door to mother	Yes	Yes	Comp-5 Exp-4	Transitional	Moderate fluent
P5	70	M	Married, lives with spouse	Yes	Yes	Comp-6 Exp - 5	Specific needs	Mild-moderate non-fluent
P6	63	M	Married, lives with spouse	Yes	Yes	Comp-5 Exp-2	Transitional	Severe non-fluent
P7	70	M	Single, in long-term relationship	Yes	Yes	Comp-7 Exp-7	Nonuser	Mild anomia, agraphia, alexia
P8	64	F	Married, in long-term relationship	Yes	Yes	Comp-2 Exp-2	Contextual choice	Global
P9	49	F	Single, lives alone	Yes	Yes	Comp-5 Exp-5	Nonuser	Mild moderate non-fluent
P10	57	M	Married, lives with spouse	Yes	Yes	Comp-5 Exp-4	Stored message	Moderate non-fluent
P11	55	M	Married, lives with spouse	Yes	Yes	Comp-4 Exp-3	Transitional	Moderate-severe non-fluent
P12	?	M	Married, lives with spouse	Yes	Yes	Comp-4 Exp-4	Nonuser	Moderate primary progressive aphasia
P13	23	M	Single, lives with parents	Yes	Yes	Comp-4 Exp-3	Transitional	Global
P14	61	F	Single, in long-term relationship	No	Yes	Comp-6 Exp-5	Specific needs	Mild non-fluent
P15	82	M	Married, lives with spouse	No	Unsure	Comp-2 Exp-2	Contextual choice	Severe fluent
P16	?	M	Married, lives with spouse	No	Unsure	Comp-3 Exp - 2	Contextual choice	Mod Severe non-fluent
P17	50	M	Married, lives with spouse	No	Unsure	Comp-3 Exp-3	Contextual choice	Global
P18	39	F	Single, lives alone	No	Unsure	Comp-4 Exp-4	Transitional	Mod Severe non-fluent
P19	58	F	Married, lives with spouse	No	Unsure	Comp-2 Exp-1	Emerging	Global
P20	68	M	Married, lives with spouse	No	No	Comp-6 Exp-4	Transitional	Moderate non-fluent

\*Communicator Type determined using Categories of Communicators with Aphasia by Lasker, Garrett, & Fox in Beukelman, Garrett, & Yorkston, 2007.

tion, P5. When asked about this, the participant related that she did not know where to access an iPod and may have missed that information during the initial large-group overview at camp. Note that distribution of posts among campers could not be determined because devices were not intentionally paired to specific individuals. Because the Chippewa Valley Aphasia Camp emphasizes the development of an environment built on the premise of participation in natural contexts, investigators did not conduct formal assessments of language abilities. Thus experimental control was sacrificed for ecological validity in this pilot investigation. While all individuals with aphasia were encouraged to participate, not all chose to do so. Because the Snapchat experience was a part of the standard curriculum at camp, consent was implied. All content was de-identified and classified by the IRB as archival data.

### Materials and Procedures

Snapchat is a social exchange app that allows individuals to take an image with their smartphone, iPod, or tablet to be sent directly to friends within their selected network. Photographs are taken and sent directly within the application and there is no need to attach them from the users' camera roll. Users have the option of sending it to selected friends in their network by selecting them individually or to send the photograph to all friends by posting it to the "My Story" area. When using the "My Story" function, viewing of the image and associated text or drawing is limited to networked friends, chosen by the user. Individuals can choose to add text, draw, and use filter features. Images posted in the "My Story" area remain for 24 hours (i.e., unless user chooses to delete their post), whereas images sent directly to an individual remain until that person views the post. Viewing images requires the viewer to touch the message while retaining contact by holding a finger on the screen until the set amount of time expires (e.g., 1-10 seconds), which is selected by the individual sending/posting the image. Users can use the "screenshot" function to capture images for later viewing or simply view in-the-moment, thus losing access to the image for later viewing. Note that when viewing images in the "My Story" function, users could view an image as many times as they wish during a 24 hour period from onset of post. The text function allows users to add text to the image by typing or using the speech-to-text technology to include a brief message (i.e., 43 characters total). A drawing function is accessed by selecting the drawing tool and using a finger to draw or write on the touch screen. Filter features,

which add time, temperature, or change aspects of the image (i.e., color tone) can be accessed by a swipe to the right.

Camp staff/investigators provided overview training on the use of Snapchat in the opening session with aphasia-friendly techniques and technologies. A document camera (Samsung SDP-900DXA), projected on a large screen in the camp's main lodge, was used to demonstrate use of the Snapchat app. Demonstrations included how to capture photos/videos, optional features (i.e., text, drawing, and/or filters), and how to post to "My Story." Campers were asked to post only to the "My Story" function, so that all generated posts could be seen by all fellow campers using the application. Direct messaging, from one individual to another was discouraged as it was not possible to collect data on these exchanges. The group training did not include instruction on how to send messages from one individual to another, only posting to "My Story." Achieving proficiency in operational competence for use of the Snapchat application was not an expected outcome of the overview training. It was recognized that potential participants had a range of previous experience with mobile technologies and apps. Further, potential participants presented with a range of aphasia types and severity, which is also likely to impact their proficiency. Part of the intent was to support each individual participant's learning and use of the iPod device and Snapchat app, providing assistance and instruction as needed in the moment of device/app use. In that manner, each individual with aphasia received the support they needed and ongoing support for troubleshooting.

Attendees were given the opportunity to take pictures of anything they wished at Aphasia Camp from late Friday morning (11:00 am) to Saturday evening (10:00 pm). Fifteen iPods (16 GB Apple 6th generation iPod touch) equipped with Snapchat and networked as "friends" were distributed to share among campers. Attendees had no set time for their part of the trial and were not restricted regarding what images to take. Investigators reserved the right to censor inappropriate images in the event that they occurred; however, this was not necessary.

Photos that were identified as taken by staff, based on content or history of the photo, were eliminated. While staff may have taken some Snapchat photos (e.g., as a means of demonstrating or modeling use), they were instructed to support campers with aphasia in taking and posting images. Thus, although procedures were in place to minimize the likelihood of staff-generated Snapchat images, there is the potential that some of the identified photos were generated from staff (i.e.,

perhaps posted inadvertently). This was deemed an acceptable occurrence given the interactive nature of Snapchat and camp. The iPods were returned to researchers Friday and Saturday nights to be charged and to screenshot images posted to “My Story” on each of the iPods. The captured images shared through the Snapchat application were downloaded each day and posted in a running news feed of camper-generated images by a designated camp staff member. Some images were also used in the Sunday slideshow along with other camp photographs taken with dedicated cameras. After the trial period was complete, researchers downloaded images captured through Snapchat onto a secure computer database for further analyses. All campers signed a consent for photograph release.

In addition to the initial group training, all individuals with aphasia, who chose to use Snapchat, had access to camp staff/investigators and volunteer assistance throughout the trial period. Note that 24 student-volunteers and ten professional staff (five speech-language pathologists, three physical therapists, one occupational therapist and one nurse) were dispersed among sessions. As such, when participants encountered device- and app (platform)-specific barriers to use, incidental support was always accessible and available in a timely manner.

### Analyses

The pilot study facilitated guided-exploration of the Snapchat app within the Chippewa Valley Aphasia Camp setting. It was not established as a formal investigation but rather as an opportunity for campers with aphasia to explore social exchange technologies in a supportive context. Staff intentionally avoided imposing too much control over the trial to assure that it was a natural, uncontrived interaction. The primary interest of the investigation was the type of photographic images, which the individuals with aphasia shared. Social interactions initiated by the posts were not measured formally but camper comments to staff and program feedback surveys were reported.

The primary data generated by this trial included photographic exchanges and some with additional text or drawing features. Quantitative data included frequency counts, including use of text and drawing functions to augment the photographic exchange. Qualitative coding conducted by the three primary researchers involved open and axial coding techniques.<sup>35</sup> As it was clearly possible to characterize captured images in multiple manners, the researchers coded the im-

ages through multiple lenses. Each researcher initially sorted images according to their own individual lens through a unique scheme. After individualized coding, all three researchers examined each other’s coding schemes. Through discussions, each of the three coding schemes that emerged from the initial sort were vetted and finalized, achieving agreement based on the operational definition established for each coding scheme, category, and subcategory. The three coders negotiated consensus on placing for placement of individual images into categories and sub-categories established through within each coding scheme. Consensus and triangulation solidified categories and subcategories of schemes, along with development of operational definitions for each coding scheme established.

The researchers acknowledge their individual biases towards the coding schemes they developed given their experiences at the Chippewa Valley Aphasia Camp. The second author was an undergraduate student at the University of Wisconsin-Eau Claire who served as a student volunteer at the 2014 Aphasia Camp. The first and third authors are co-founders and staff members at the Chippewa Valley Aphasia Camp and Professors at the University of Wisconsin-Eau Claire where student-volunteers are recruited and trained. The fourth author is the Chippewa Valley Aphasia Camp founder and Mayo Clinic Health System-Eau Claire employee.

## RESULTS

A total of 174 posts were collected and analyzed from the trial study. All of the images captured through Snapchat were posted. A small number of photographs were inadvertently sent only to another individual iPod and were not included in these analyses. Unfortunately, the exact number could not be tallied as those messages were only posted to specific “friended” iPods. The majority ( $n=174$ ) were posted to the “My Story” function, so that others could see the post.

Along with the ability to capture and share images with the application, some campers utilized other Snapchat features. There were 38 out of 174 posts that contained a Snapchat feature (22%). The specific features included the following: text feature ( $n=29$ ), drawing feature ( $n=4$ ), both text and drawing features ( $n=3$ ), other swiping/filter application features (e.g., speed, time) ( $n=2$ ). For examples of each feature, see Figure 1. Note that camper faces and text have been pixelated to de-identify images. In addition, among the 174 total posts, 105 were taken indoors (60%) versus 69 taken outdoors (40%).

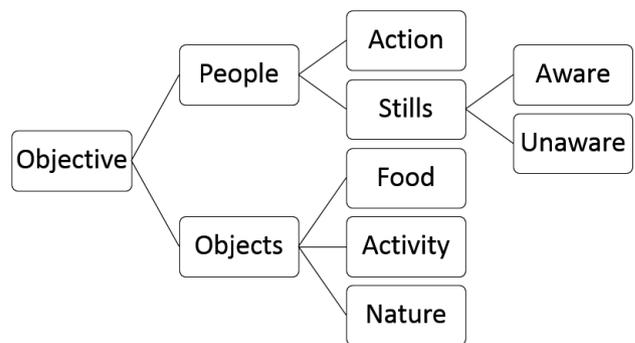
Authors one, two, and three analyzed the images individually, categorizing by their own lens using non-hierarchical, open and axial coding techniques.[35] The three authors met to negotiate consensus on their coding schemes and categorization for images over the course of two four-hour meetings, where multiple modifications were made through consensus coding. The process resulted in three schemes: *Objective*, *Participation*, and *Formal-task associated interactions versus informal interactions*.

The *Objective* scheme, initiated by the second author, was based upon the concept of “dynamic capture,” which uses photographs captured in-the-moment to share an experience.[36] This scheme was divided into two categories: *people* (i.e., image includes people, n = 154, 89%) and *objects* (i.e., image includes objects only with no people, n = 20, 11%). The subcategory of *people* was divided into *action* (i.e., image includes people engaged in an activity, n = 87) and *stills* (i.e., images of people not engaged in activity, n = 67). *Stills* were distributed into additional subcategories of *aware* (i.e., images of people who were posed for the camera and/or clearly aware a picture was being taken, n = 59) and *unaware* (i.e.,

images of people who were unaware that their picture was being taken, n = 8). The *objects* category was divided into *food* (i.e., images of food, n = 3), *activity* (i.e., images of a camp-related activity, n = 4), and *nature* (i.e., images of landscape and/or nature without people present, n = 13). See Figure 2 for distribution of categories and subcategories.

See Figure 3 for photographic exemplars of each category and subcategory.

The *Participation* scheme, generated by the first author, in-



**Figure 2.** Objective coding scheme, distribution of category and subcategories.



**Figure 1.** Examples of images that included Snapchat features (from left to right: text feature, drawing feature, text and drawing, time and drawing/writing).



**Figure 3.** Exemplars of images within the Objective lens.

cluded three categories: *interactive* (i.e., two or more people mutually engaged, n=113, 65%), *non-interactive* (i.e., two or more people not engaging each other, n=40, 23%), and *uncoded* (i.e., identified as uncodeable, n=21, 12%). The *interactive* category was further subdivided into the subcategories of *people* (i.e., image includes people, n=87) and *environment* (i.e., image includes physical environment with no people, n=26). In addition, the *non-interactive* category was further divided into *more than one person* (i.e., images of two or more people not interacting with each other, n=14) and *solo* (i.e., images of one person taken by other or selfie, n=26). See Figure 4 for distribution of categories and subcategories.

See Figure 5 for photographic exemplars of each category and subcategory.

The *Formal-task associated interactions versus informal interactions* scheme, developed by the third author, was defined as images that captured individuals directly engaged in a camp session, versus individuals interacting outside of a formal activity. This scheme was divided into three categories: *activity specific* (i.e., images of people engaged in a camp session, n=73, 42%), *informal interactions* (i.e., images of people

outside of camp sessions, n=71, 41%), and *uncoded* (i.e., identified as uncodeable, n=30, 17%). See Figure 6 for distribution of categories.

See Figure 7 for photographic exemplars of each category.

## DISCUSSION

The exploration of Snapchat within the Aphasia Camp setting allowed for campers to share a variety of experiences with others. It is pertinent to recognize that the photographs that campers chose to take and share represent some level of in-

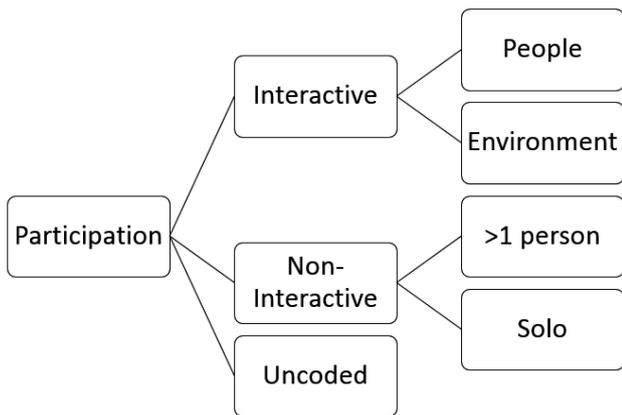


Figure 4. Participation coding scheme, distribution of category and subcategories.

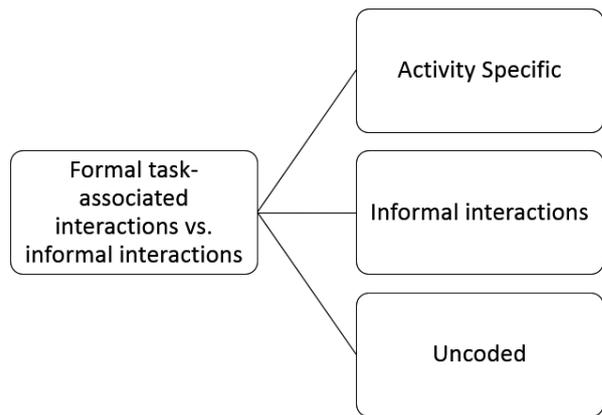


Figure 6. Formal-task associated interactions versus informal interactions coding scheme, distribution of categories.



Figure 5. Exemplars of images within the Participation lens.



Figure 7. Exemplars of images within the Formal-task associated interactions versus informal interactions lens.

tent. Campers had a variety of options of what to photograph, including other campers, students, or staff; equipment and materials within sessions; and the buildings or outdoor environments at camp. Thus, distribution of photograph posts across those elements indicates some intent to convey what they valued and wished to share with others. By examining camper posts through three coding schemes, we can derive some information about the camp experience and the potential of Snapchat as a social exchange tool for individuals with aphasia. Quantitative information about number, type, and posting features addresses feasibility, while qualitative analyses provide important information about the types of information individuals with aphasia may choose to share. The posting of 174 posts over the course of two days, in the midst of other camp activities, suggests that individuals with aphasia can use the Snapchat app somewhat proficiently, given support of staff and volunteers. They also demonstrated the ability to add text, drawing, and swiping/filter features to enhance their photographic message.

Campers took these images while engaged in other camp sessions, such as archery, hiking, crafting, meal times, down times, and others. It is clear that certain session types were more conducive to capturing images than others, where physical engagement was more intensive or activity context reduced opportunities to capture images (e.g., woodworking). Data about how often others viewed posts within the “My Story” area is not available. However, campers reported seeing pictures of other campers in different sessions. Further, many of the images posted to “My Story” were played on a slideshow loop, which was displayed in the main lodge and ran several hours each day. Campers specifically commented about images shared by other campers via “My Story” (i.e., a stone arch taken by campers on a hike, images of bullseye arrows taken during archery, campers engaged in laughter-yoga, etc.). There was chatter and excitement as several campers commented about the potential use of Snapchat on their own devices (i.e., cell phones, tablets, etc.) outside of the camp setting. Campers asked questions about how to download the app and how to add friends once they returned home. Unfortunately, because many of these comments took place in conversations between staff or student volunteers and campers, rather than directly between “investigators” and campers, we are unable to report specific numbers of camper statements. Further, it is not clear whether these comments arose from campers viewing posts on Snapchat versus viewing the posts on the daily digital slideshow display or both. A

number of the images were group selfies, which indicates that some social exchange occurred through mutual engagement in Snapchat.

Within the *Objective* scheme, it is evident that the images primarily focused on *people* (154/174; 89%) rather than *objects* (20/174; 11%). This implies that fellow campers were important in this context and may indicate some relationship connections. Ketelle [37], a social scientist who examines photography as a visual narrative, identified that photography “... (a) is context-dependent; (b) relies on retrospective meaning making of their subjects; and (c) tells a story.”<sup>(p. 550)</sup> Likewise, Harper [38] identifies photo-elicitation as a form of text. If we adhere to this interpretation, camper images are a means of sharing their narrative of the camp experience through context-dependent images.

Sub-categories within the *Objective* scheme capture the contexts shared by campers. Images of *action* were slightly more prevalent, making up about 56% of the *people* category, compared to *stills*, which consisted of about 44%. *Action* images captured many camp activities such as golf, archery, and technology sessions. The images of *stills* appeared to highlight the camp environment and social engagements. Most of the *stills* captured images of people that were aware (88%) versus only a few who were *unaware* (12%) that they were being photographed. The *aware* images consisted of selfies and campers taking pictures of others posing. This may suggest that interactions at aphasia camp help to facilitate social closeness, as participants chose to share images of connections with other campers. The *objects* included the food, activity-equipment, and nature that surrounded camp. It appears that participants found *people* to be a more substantial component to share within the camp setting compared to *objects*. This may further suggest the impact that campers have on each other at camp. In posting to Snapchat, participants chose what to share with others. This may reflect their desire to share elements of identity, such as who they are and what they value [12]. This parallels a principle of using images to convey complex thoughts and constructs, which has been identified in other research examining participant-generated photography.[27-29,39] In their work, Miller and Happell [29] used participant-generated photography for persons with schizophrenia, as a way to express complex emotions. Brown and colleagues [27] found that participant-generated photography augmented the interview process by providing another modality for individuals with aphasia to exchange their thoughts. Digital photography was used as a way to augment

self-expression by Levin and colleagues [28] in discussion of reintegration, socialization, recreation, and education after aphasia. Our investigation also suggests that individuals with aphasia may be able to use photographs as a modality to express what they struggle to verbalize.

Interaction and engagement were prevalent themes in the *Participation* scheme. In fact, 65% of the images (113/174) included two or more campers engaged in interaction. Further, even the non-interactive posts (n=40, 23%) included images of people engaged but not interacting with others. Of these images, 26 were selfies, which was a fairly new phenomena for several of the campers. In 2013, a year prior to this trial, 'selfie' was named word of the year by Oxford dictionaries given frequency and prominence of use. This selfie phenomena seems to reflect engagement with the technology and perhaps self and others. Photography theorists note that when individuals capture an image of themselves in a front-facing camera, the preview shows a mirror image of their face [40]. However, the image is reversed or converted to the back-camera view of another photographer. Frosh [41] identifies (in selfies) an important shift from photography as a way to share a moment in time from the photographer's vantage, towards a form of discourse. Frosh [41] relates "The advent of photography as a 'live' medium, using digital networks to connect interlocutors in space rather than time, brings it closer to a conversational practice that draws images and their referents into the immediate moment of discursive interaction, which applications like Whatsapp and especially Snapchat both promote and exploit" [41] <sup>(p1609)</sup>. The selfie is thought to capture a relational positioning between interlocutors, with an individual(s) in one place interacting with an individual(s) in another place while being mutually connected [42]. Others have described the selfie as a gesture, noting that gestures and expressions have important meaning in face-to-face interactions, which can also be transferred through selfie images along with the image and context [43]. The sharing of selfies and engagement images suggests that campers value participation and interaction with other campers. The sharing, in this case, appears to be a form of non-linguistic and lite-linguistic (i.e., when text supplements the image) communication. Farman [43] and Miller [44] suggest that the selfie phenomena may parallel *phatic communion*, a type of non-substantive speech that emphasizes social connection (e.g., "chillin'" or "whatzzup" or "cool"). This phenomena may also relate to non-substantive posts or tweets on social media or simply "liking" another person's post. This phenomena has also been observed within

the speech-language pathology discipline with respect to non-substantive social exchanges [8,24].

The *Formal-task associated interactions versus informal interactions* scheme highlights the importance of creating physical and partner environments conducive to effective interactions and engagement. Interactions or engagement identified as *formal-task associated interactions* include those that were preplanned as a part of the camp curriculum, such as the formal activity sessions. *Informal interactions* were those that occurred during down-time, and during unscheduled activities such as spontaneous card games, walks, coffee breaks, or on the dock. These interactions were not structured or scheduled, but were encouraged as part of the camp experience. The idea of intentionality is key to this notion in the case of both types of interactions, as even downtime activities are not haphazard and students are trained to capitalize on the interactions in transit or during downtime. Similar to the description of non-formal learning by Eshach,[45] these informal interactions at camp occur "in a planned but highly adaptable manner" [45] <sup>(p173)</sup>. Tseng and Seidman [46] describe the benefits of both structured and unstructured activities in their descriptions of youth programming. While certainly there are differences given the age of the aphasia camp participants, they likely experience similar benefits within the informal interactions. Such *Informal interactions* have "less fixed, institutionally-directed goals, but activities nevertheless service particular functions..." [46] <sup>(p221)</sup> Oblinger [47], in examining learning on university campuses, explored the idea of serendipitous learning. She identified that well-designed environments are a key to fostering serendipitous (i.e., unstructured, unplanned) learning. "It can bring people together; it can encourage exploration, collaboration, and discussion" [47] <sup>(p1.1)</sup>. Brown and colleagues [48] examined serendipitous interactions in work settings, finding that those types of interactions lead to enhanced productivity, collaboration, and knowledge sharing. The two factors they identified as facilitating are sharing culture in a multicultural workplace and the physical space. Through the images captured at camp, participants may have uncovered the importance of serendipitous interactions. In fact, 41% of images captured identify people outside of camp sessions, 42% of images captured people in sessions, and the remaining 17% were uncodeable. While campers appear to value participation and experiences within structured sessions, they also acknowledge the importance and value of *Informal interactions* within the images they capture and share.

### Implications

This pilot investigation demonstrates the feasibility of using Snapchat as a social exchange tool for individuals with aphasia. Participants posted images of a variety of experiences and encounters during a two-day trial at an aphasia camp. It is clear that the camp environment and accessibility to staff support influenced the success and nature of images posted. The images campers chose to capture and share appear to reflect something about what they value within the context of those interactions. Further, the pilot offers insights into the aphasia camp experience through the lens of campers. It is possible that the participants' posting success and the nature of images captured may differ in other community-based contexts.

### Limitations

Researchers recognize several limitations within the pilot study. This study was an exploration of Snapchat within the natural aphasia camp setting, which resulted in limited control. In order to avoid creating the sense of the camp environment as a petri dish for research, investigators intentionally sacrificed experimental control for ecological validity. Because other individuals were allowed to experiment with and/or model use of Snapchat, investigators had to eliminate some posts to assure that analyzed posts were made by individuals with aphasia. Despite these efforts, it is possible that some of the analyzed posts were made by partners of individuals with aphasia.

While incidental supports and troubleshooting provided by student volunteers and staff contributed to successful usage of Snapchat, these supports also served as a limitation and intervening variable in this pilot. When campers encountered difficulty using the device or application, they were able to ask a volunteer or staff member in-the-moment to receive immediate troubleshooting and resolution. This likely contributed to the proliferation of posting, which may be constrained by situations where support is not immediate. While training was not extensive, campers were able to learn how to use the device and Snapchat app implicitly and through guided learning.

One of the primary functions of social exchange platforms is to foster reciprocal interactions between participants. While campers were able to view each other's respective posts through the "My Story" function, they were also able to view camper posts through the video news feed that looped captured images on a monitor in the camp's Main Lodge. While posting captured images in this forum may have motivated participants to post more, it may have reduced camper need

or initiative to view and respond to posts in the "My Story" area. Further, there were inconsistencies in the fidelity of Wi-Fi signals throughout the camp, which delayed post-release times, thus changing the spontaneity and potential for immediate reciprocal exchanges.

One of the challenges of using a universal application such as Snapchat is limited access to metadata from individual devices or a central server. This limited the ability of investigators to examine which posts were opened by other campers and which posts resulted in a posted response. This further limited potential follow-up questions about the social exchanges that may have occurred. These are all questions the investigators hope to address in a more controlled trial of Snapchat, which is forthcoming.

### Future Directions

The current investigation was conducted as a pilot study for a follow-up investigation, which will examine a one-month trial of the device for social exchanges between individuals with aphasia. Drawing upon the principles of Dynamic Capture identified by Beukelman [36], the Snapchat app and perhaps similar, mainstream apps such as Instagram have the potential to serve as a modality for social sharing through images. Given the outcomes identified by Buhr and colleagues [24,25], picture-initiated posts were both more effective initiating posts and a preferred tool by individuals with aphasia. Further, while individuals with aphasia valued the AphasiaWeb application as a forum to interact with others with aphasia, they also identified the desire to use more universally available social exchange technologies for interactions with friends and family without aphasia. Beyond the exploration of Snapchat as a potential exchange tool, the authors have considered examination of related social exchange technologies.

### CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

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