Text Messaging "helps me to chat": Exploring the Interactional Aspects of Text Messaging Using Mobile Phones for Youth with Complex Communication Needs

Clara Wepener*, Ensa Johnson https://orcid.org/0000-0001-6203-1433, and Juan Bornman https://orcid.org/0000-0001-9685-3750

Centre for Augmentative and Alternative Communication, University of Pretoria

* Correspondence concerning this article should be directed to Clara Wepener, Centre for Augmentative and Alternative Communication, University of Pretoria, Private Bag X20, Hatfield, Pretoria 0028. E-mail: clarawepener@gmail.com

Author Note

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Abstract

This study explored the interactional aspects of text messaging on mobile phones for youth with complex communication needs. A qualitative case study design was used to investigate aspects such as reasons, place, timing of communication, content and communication partners. Data were gathered from seven youth with complex communication needs (primary participants) and one communication partner for each youth (secondary participants). In addition to using a questionnaire and tests to obtain participant background information, four data collection methods were used: (a) face-to-face interviews with the primary participants via text messaging, (b) researcher observations of these participants interacting via text messaging, (c) an asynchronous text-messaging focus group involving all seven primary participants, and (d) asynchronous interviews with the secondary participants via text messaging. The thematic data analysis highlighted numerous interactional benefits, most notably that text messaging offered the youth with complex communication needs a means of expressing themselves that was easier than face-to-face interactions. It also emphasizes interaction symmetry with a wide range of communication partners including groups, the privacy to interact with others beyond their often-restricted environments (absent presence), and a measure of anonymity and control over interactions. The study concluded that text messaging provides youth with complex communication needs with new communication possibilities.

Keywords: Augmentative and alternative communication; Complex communication needs; Mobile phones; Texting; Youth

Mobile phone usage has become a ubiquitous phenomenon, with more than five billion mobile phone users in 2019 – more than half of them smartphone users (Pew Research Center, 2019). In South Africa, where the current study was conducted, mobile phone ownership has increased to 93%, of which 60% are smartphones (Pew Research Center, 2019). These devices have a wide range of functionality and are used for text-based communication, known as text messaging or texting. In the present study, the term *text messaging* is broadly used to include text messaging on mobile phones as well as instant messaging on newer smartphones.

Text messaging is a particularly favoured means of communication for today's youth. The literature on the use of text messaging using mobile devices reports that youth experience text messaging as a fast, easy, convenient, playful, and inexpensive means of communication (Agosto & Abbas, 2012; Blair et al., 2015; Church & de Oliveira, 2013; Yoon et al., 2015). It also allows a measure of independence and emancipation (Grinter et al., 2006; Thurlow & Poff, 2013) and provides social connection (Ling, 2007; Reid & Reid, 2004).

Individuals with disabilities need the same access to technologies as their peers without disabilities if the digital divide between individuals with disabilities and non-disabled peers is to be reduced and if further isolation and marginalization are to be limited (Baker & Bellorde, 2004; Barlott et al., 2016; Borg et al., 2015; Bryen & Moolman, 2015; Darcy et al., 2016). Access to mobile devices is particularly important for youth with disabilities, as they are more concerned about the ways in which they are similar to their peers without disabilities than about the differences between them (Wickenden, 2011). Limited social participation in peer activities by youth with disabilities may have a negative effect on their development of relationships and sense of belonging and could ultimately reduce their quality of life (Grace et al., 2014; Thirumanickam et al., 2011).

Universal design principles have improved access to mainstream mobile devices for many individuals (Bryant & Bryant, 2012). Although access for all has not been fully realized, numerous authors have reported on the ownership and use of these devices by individuals with disabilities in general and individuals who use AAC in particular (Bryen & Moolman, 2015; Bornman et al., 2016; McNaughton & Light, 2013; Meder & Wegner, 2015; Morris & Bryen, 2015; Niemeijer et al., 2012; Shane et al., 2012). According to these studies, individuals with complex communication needs use their mobile devices to interact with others via text messaging, email, or social media sites. They also use them to access information and entertainment, to run errands (like shopping and banking), to contact others during emergencies, for further education, etc. The use of asynchronous communication by individuals with disability-related challenges allows them to interact in their own time, thereby reducing response-time pressures (Blackstone et al., 2007; Paterson, 2017). Qualitative studies on the personal experiences of individuals with disabilities with regard to their use of social media have highlighted the value of this platform for greater social engagement, independence, and self-representation – despite specific challenges in the form of technical barriers (Alant, 2017; Caron & Light, 2016; Grace et al., 2014; Hynan et al., 2014; 2015).

The previously noted studies have shed light on important benefits and challenges of mobile device use for individuals with disabilities; however, there is a paucity of descriptive research exploring the in-depth use of text messaging by individuals with complex communication needs, even though it has been acknowledged as a frequent communication activity for these individuals (Bornman et al., 2016; Morris & Bryen, 2015). McNaughton and Light (2013) explain that, although mobile devices have opened new communication possibilities for individuals with complex communication needs, research is essential to establish whether the

use of these devices can fulfil their real-life communication requirements. It is therefore important to establish if text messaging offers the same (or similar) benefits to youth with complex communication needs who may have associated challenges that affect their use of mainstream mobile devices (Kagohara et al., 2013). Although the effective use of text messaging is of global importance, it may be especially pertinent in low- and middle-income countries such as South Africa, where dedicated communication devices are not always readily available, affordable, or accessible (Van Niekerk et al., 2019).

The main aim of the present study was to explore and describe the interactional aspects of text messaging on mobile phones for youth with complex communication needs. The following research questions were posed: (a) Why do youth with complex communication needs and their selected communication partners like (or dislike) interacting via text messaging? (b) Who are the communication partners with whom youth with complex communication needs use text messaging? (c) What is the functional orientation of their text-messaging content? (d) When (time) and where (place) does text messaging takes place? (e) How do youth with complex communication needs use text messaging to increase the ease and rate of their interactions? (f) How does text messaging permit its users to maintain interaction and repair potential communication breakdowns?

Method

Participants and Setting

A total of seven youth with complex communication needs – Xolani (PP1), Nomsa (PP2), Elijah (PP3), Naleli (PP4), Tapiwa (PP5), Mayowa (PP6), and Boipelo (PP7) (pseudonyms) -- were recruited as primary participants. Additionally, one communication partner each, nominated by the primary participants, were involved as secondary participants (SP1, SP2, SP3,

SP4, SP5, SP6, and SP7). Professionals who work with youth with complex communication needs (e.g., speech-language therapists at schools for children with special needs and the coordinator of a youth empowerment program for young adults with complex communication needs who use AAC) were asked to identify potential primary participants based on specific selection criteria (see below). A total of 11 potential primary participants were identified. Next, all potential primary participants were screened by the researcher to ensure that they met the following selection criteria: (a) be between the ages of 15 and 24;11 (years; months) (the age range used by the United Nations when referring to youth) (United Nations Department of Economic and Social Affairs, 2013); (b) have complex communication needs and unable to rely on speech to meet all their communication needs due to poor speech intelligibility (based on the definition of Caron & Light, 2016); (c) be able to converse in English and to interact with the researcher and other participants in a common language; (d) have access to a mobile phone with the WhatsApp[1] messaging application (the most common messaging application in South Africa at the time of the research) (Simons, 2017); (e) have the operational skills to use a mobile phone to type, send, and access text messages via WhatsApp; and (f) have the functional literacy skills required to type comprehensible text messages as well as read and comprehend text messages received via WhatsApp.

Because there is no specific measure for the type of literacy required for text messaging, a custom-designed Messaging Screening Checklist (Wepener, 2019) was used as a functional activity-based and criterion-referenced task. In line with a study by Hynan et al. (2014), effective engagement in the activity that requires literacy was seen as functional.

The screening process eliminated four of the 11 potential primary participants: two who did not use WhatsApp and did not want to have the application installed on their mobile phones,

and two who did not meet the literacy requirements. The remaining seven were recruited to participate in the study. Each primary participant was subsequently asked to nominate a communication partner with whom they enjoyed interacting via text messaging (specifically WhatsApp) and who would act as a secondary participant. The nominated communication partners were contacted by the researcher via WhatsApp and recruited for the study once they had given their consent via WhatsApp.

Settings. Face-to-face interviews with primary participants took place in locations of their choice. Interviews were held in individuals' homes (Nomsa and Naleli respectively), at a school (Mayowa), in a public library (Xolani), in an office in a shopping centre (Elijah and Tapiwa) and at a group home (Boipelo). All in-person interviews were video recorded by the primary researcher.

Demographic information pertaining to the primary participants, including their relationship to their selected communication partners, is provided in Table 1.

Research Design

When technology is used for communication, it is important to consider personal factors of the device user, such as fine motor control and literacy skills, the functionality of the device used for the activity, and the context in which the activity takes place (Cook & Hussey, 2002). When investigating communication as a reciprocal and interactive process, it is also essential to consider the role of communication partners (Blackstone et al., 2007; Light & McNaughton, 2015). These important considerations guided the choice of research design selected for the current study, namely a qualitative case study design.

Table 1

Participant Demographics (n =7), Including Relationship to Secondary Participant (SP)

Characteristics	Xolani (PP1)	Nomsa (PP2)	Elijah (PP3)	Naleli (PP4)	Tapiwa (PP5)	Mayowa (PP6)	Boipelo (PP7)
Age (years;months)	21;5	24;7	23;7	21;11	22;7	18;4	18;2
Gender	M	F	M	F	M	F	F
Communication other than text messaging	Speech, gestures, writing, email, tablet speech app	Speech, gestures, facial expressions	Speech, gestures, smartphone speech app	Speech, gestures, facial expressions	Speech, gestures	Speech, gestures	Speech
Speech intelligibility	0%	0%	6%	0%	6%	24%	70%
Primary language	isiZulu	isiXhosa	Shangaan	Sepedi	Setswana	English; Yoruba	Tshivenda; Setswana
Primary text messaging language	English; isiZulu	English	English; Afrikaans	English; Afrikaans	English	English; Afrikaans	English
PPVT-4[a]	8;8	4;7	5;9	5;6	7;2	14;5	5;8
GMFCS-E&R[b]	Level 1	Level 4	Level 1	Level 2	Level 2	Level 3	Level 4
MACS[c]	Level 1	Level 2	Level 1	Level 2	Level 3	Level 2	Level 2
KBIT-2[d]	Average	Lower extreme	Average	Below average	Average	Average	Average
Education	Grade 12	Grade 7	Grade 12	Adapted Grade 9	Grade 12	Grade 9	Grade 9
Mobile phone use	Since 2009	Since 2001	Since 2008	Since 2007	Since 2017	Since 2007	Since 2009
Live/work	Lives in apartment/ first-year student at university	Lives at home/part of church media team	Lives at home/works at a clothing store	Lives at home/works at a centre for children with disabilities	Lives at home/ in the process of obtaining school-leaving certificate	Lives at home,/second year attending a training academy	Lives in group home for persons with disabilities/ writing her memoirs
Relationship to SP	Friend	Friend	Friend	Sister	Friend	Friend	Mother

Note: CP = cerebral palsy; SCI = spinal cord injury; app = application.

[a] PPVT-4 = Peabody Picture Vocabulary Test, Fourth Edition (Dunn & Dunn, 2007). [b] GMFCS-E&R = Gross Motor Functional Classification System - Expanded and Revised (Palisano et al., 2007). [c] MACS = Manual Ability Classification System (Eliasson et al., 2006), specifically hand function used during text messaging. [d] KBIT-2 = Kaufman Brief Intelligence Test, Second Edition (Kaufman & Kaufman, 2004), descriptive category of standard score

A qualitative case study design is a pragmatic and flexible approach that was well suited to provide detailed descriptive information about text messaging of individuals with complex communication needs. A case study design involves an individual or small group of participants in real-world settings, and often includes the accounts of participants themselves (Baxter & Jack, 2008; Creswell & Poth, 2018; Harrison et al., 2017; Yin, 2014). According to Blackstone et al. (2007), the active involvement of people who rely on AAC is a key principle in AAC research and practice and the youth with CCN were thus selected as the primary participants.

Moreover, this design allows for the use of multiple methods of data collection (observations, interviews, focus groups) and different sources (both members of the communication dyad). This meant that data collection could include detailed descriptions of the primary participants, their use of text messaging and the interaction contexts in which these interactions occurred, as well as information provided by secondary participants who regularly interact with the primary participants via text messaging. Multiple methods of data collection using different sources also allowed for method and source triangulation (Carter et al., 2014; Yin, 2013).

Because the researcher is key in the development of appropriate questions in a qualitative study as well as in data collection and analysis (Creswell, 2014), it was essential for the researcher of the current study to be aware of possible biases due to the differences between the participants and herself with respect to age, and cultural and economic background (Salkind, 2006). The case study design furthermore allowed the researcher to be sensitive to the needs of the participants by, for example, selecting suitable sites for conducting the research (Creswell & Poth, 2018), which was an important consideration for participants who experienced mobility challenges.

Researchers

The first author served as primary researcher. An independent qualitative researcher, along with two independent coders with relevant experience, performed data checks.

Ethics and Consent

Before recruiting participants to the study, ethics approval was obtained from the Research Ethics Committee at the Faculty of Humanities at the University of Pretoria. The potential primary participants were requested to sign informed consent letters. Because some of them were younger than 18, their parents signed the consent letters, while they signed assent statements.

Materials

A custom-designed text-messaging screening tool that consisted of an interactive messaging task in English and a researcher checklist (Wepener, 2019) was used to screen the primary participants. The following materials or tests were also administered to describe the primary participants (Table 1) and provide information that enabled the researcher to consider personal aspects in the interpretation of the data: (a) A custom-designed Participant Background Information Form; (b) the Assessment of Intelligibility of Dysarthric Speech Test (Yorkston & Beukelman, 1981); (c) the Gross Motor Function Classification System Expanded and Revised (GMFCS-E&R) (Palisano et al., 2007); (d) the Manual Ability Classification System (MACS) (Eliasson et al., 2006) (specific to text-messaging execution); (e) the Nonverbal Subtest of the Kaufman Brief Intelligence Test, Second Edition (KBIT-2) (Kaufman & Kaufman, 2004); and (f) the Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4) (Dunn & Dunn, 2007).

A number of custom-designed materials were used for collecting data from the primary participants: (a) a primary participant interview script that contained questions linked to the

specific research questions (e.g., “What do you like about WhatsApp?” “Who do you WhatsApp with often?” “What do you talk about?”); (b) the WhatsApp focus group script, which contained questions to stimulate a more in-depth group discussion among the primary participants on their use of text messaging building on the questions in the interview scripts (e.g., “How do you feel about discussing something personal on WhatsApp?” and “Are there places where you are not able to WhatsApp? Why?” [Wepener, 2019]); (c) an individualized member-checking script containing all of the information provided by each primary participant, to ensure that the recorded information had been correctly understood and documented by the researcher (Wepener, 2019); and (d) a communication partner interview script, which mirrored the primary participant script, used with the secondary participants (Wepener, 2019). A researcher observation form was used to record the primary participant’s activity of sending and receiving text messages on WhatsApp, as well as the setting and mood of the interview.

Procedures

Data Collection

In addition to the materials or tests that were administered to describe the primary participants, data were collected by the researcher using the four data collection methods described earlier: (a) Face-to-face interviews with the primary participants using WhatsApp; (b) observations by the researcher to document how the primary participants execute text messaging; (c) an asynchronous WhatsApp focus group with all primary participants; and (d) asynchronous interviews via WhatsApp with the secondary participants (communication partners).

The researcher’s use of WhatsApp rather than conventional spoken language for questioning and answering enabled her to build rapport and engage with the participants who did not have another form of AAC. During the interviews, the researcher also made field notes to

document how the primary participants accessed their mobile devices in a specific setting, thereby adding more relevant, rich contextual information. The video recordings of these interviews allowed the researcher to accurately complete her observation records and add the use of speech and gestures to the text-messaging transcripts.

The asynchronous WhatsApp focus group with the primary participants was active over a period of 5 days and stimulated meaningful interaction among participants regarding the same topics discussed during the face-to-face interviews, without pressure due to response timing.

Asynchronous text messaging interviews were conducted with all of the secondary participants via WhatsApp, as this was the means of communication that they used to interact with the primary participants. Furthermore, this method of data collection eliminates boundaries related to both time (participants can select a suitable time to respond, which encourages involvement) and space (the geographical setting becomes obsolete) (King et al., 2019; Morgan & Lobe, 2011).

The researcher downloaded the interviews and focus group discussions by means of the WhatsApp application on her laptop computer, thereby eliminating transcription errors (Creswell, 2014). Direct transfer of the data also ensured that the text messages retained their original format, including lack of punctuation, errors, and use of emojis. Text messages containing language switching and shortened words were also left unchanged, with the meaning of the latter explained in parentheses, for example “hayibo” (wow! really? can it be?) and “huw” (how are you doing?). The notational conventions proposed by Von Tetzchner and Basil (2011) were used for speech and gestures added to the primary participant interview transcripts so as to record all modalities of communication used during these interviews.

Data Analysis

The data transcripts were uploaded onto ATLAS.ti 8, a computer-aided qualitative data analysis software for analysis. Thematic analysis as described by Clarke and Braun (2013) was used to analyze the data provided by the participants and their communication partners, the observations documented by the researcher, and specific text-messaging features noted in the text messages sent by the participants. The researcher used an abductive approach to coding (a combination of a top-down and bottom-up approach). This meant that the research questions ("why", "who", "what", "when", "where" and "how") were considered main themes (thematic areas) and were used as a point of departure for the coding (King et al., 2019). The research questions were translated into the main themes (a) Communication Benefits and Challenges ("why"), (b) Communication Partners of Youth with Complex Communication Needs ("who"), (c) Communication Content ("what"), (d) Interaction Convenience ("when" and "where"), (e) Interaction Ease and Rate ("how"), and (f) Communication Maintenance and Repair of Breakdown ("how").

Within these main themes, numerous cycles of coding were employed, including initial descriptive coding of all meaning units (a single word or phrase was defined in a code book), followed by interpretive coding (categorization). Lastly, the researcher identified sub-themes from within each main theme (Braun & Clarke, 2006; King et al., 2019) (Table 2). As this was a descriptive study, all of the sub-themes that were conceptualized are reported – not only the frequently occurring ones (Braun & Clarke, 2006).

Table 2
Overview of Themes and Sub-themes, Including Examples

Main themes	Sub-themes	Example(s)
Communication benefits and challenges	Main benefit	Well whatsapp for me it's easy (PP5) It's an easiest way of communicating with her (SP2)
	Main challenge	It's needs data. Sometimes I don't have money to buy data so I can't community with the people I want to (PP3)
Communication partners	Types of partners	A girl that I have a crush on 😍 (PP1)
	Partner symmetry	It's a platform for for [sic] verbal and non-verbal to interect [sic] and engage together (PP1)
	Barriers related to persons	I don't read Tswana (an indigenous language) (PP3)
Communication content	Range of topics	You can talk about anything on WhatsApp (PP2) Many things (PP4) U (you) can talk about anything you want no matter what (PP7)
	Orientation of topics	We like to give each other ideas…Like what will happen if you get a guy from church (PP4)
	Privacy of interactions	My phone is my privacy (PP2)
	Expression of feelings/ emotions	You can express your feelings. During you type on WhatsApp you have gaven Imojis [sic] like this 😂 (PP7) She expresses herself by using animations as well (for example) 😍😘👍🙏 (SP2)
Interaction convenience	Places conducive to interaction	Anywhere but I prefer being in my room (PP1)
	Barriers related to place	I don't like to walk on the street & texting especially at night (PP3)
	Times conducive to interaction	When we have data is almost the hole [sic] day (SP7)
	Barriers related to time	I don't have data (PP5)
Communication maintenance and repair of breakdown	Maintenance features	It's show [sic] when the person have [sic] read the message by two blue right mark (PP3)
	Breakdown frequency	There's a minimum change of being misunderstood or misinterpreted (PP6)
	Types of breakdown	I misunderstand the words "fun". My mind was thinking of something else well she mean [sic] something else (PP3)
	Repair strategies	I send her this ????? Then she knows that I don't understand (PP6) I ask my little brother to tall (tell) me wat she say 👧 [sic] (PP4)
Interaction rate and ease	Variables influencing response rate	Sometimes I need him urgently or he needs me urgently but we unable to communicate because I either don't have data or he doesn't have it (SP3)
	Ease- and rate-enhancing strategies	There is a shortly words that person can use (PP5) 🚌 use pictures (PP3)
	Ease- and rate-enhancing device features	I have a funny predictions [sic] which make it easier for me to type faster (PP1)

Reliability

The independent qualitative researcher checked a randomly selected 20% of the data, to ensure correct data transfer. To ensure that the scripts used for data collection were accurately

followed (Schlosser, 2002), this same researcher compared the transferred data against all the scripts, as well as the completed observational forms with the video recordings; and an average procedural reliability score of 99.5% was obtained. The two independent coders coded 20% of the data using a code-confirming strategy (King et al., 2019). Any discrepancies between the three coders were debated until consensus was reached.

Triangulation

The use of four methods and three sources of data collection enhanced the validity of the findings (Carter et al., 2014). The information obtained from each primary participant was related to the information obtained from the secondary participant who interacted regularly with the primary participant via text messaging, as well as the observations documented by the researcher. The qualitative nature of the study also meant that any apparent conflicting information was reported and thickened the interpretation of the data. For example, all primary and secondary participants described text messaging as “easy” even though the researcher observed and reported fine and gross motor limitations affecting messaging speed. However, the researcher was able to better understand this statement in light of the observation and documentation that primary participants had very limited other means of interaction.

Results

The sections that follow describe data collected from the face-to-face interviews and primary participant focus group, organized according to the main themes. Included are results from the different sub-themes (Table 2).

The detailed data describing the primary participants and their observed use of text messaging in specific contexts can be viewed in Wepener (2019).

Communication Benefits and Challenges

Overall, ease-of-use was the main benefit of text messaging highlighted by both primary and secondary participants. For example, Nomsa described text messaging as “easy for people with disabilities”; Mayowa said she was able to “communicate better with people without them struggling to understand what I am saying,” and Xolani said much the same, adding “without me have [sic] to repeat myself.” The main challenge mentioned was being able to afford to buy enough data, even though the participants regarded WhatsApp as the least expensive messaging platform.

Communication Partners of Youth with Complex Communication Needs

Three sub-themes were associated with communication partners: Types of partners, Partner symmetry, and Barriers related to persons. The primary participants reported that they mainly used text messaging for interacting with family, friends and romantic partners. Naleli’s sister remarked that “I don't think it can get any better as it is right now really... it already connects her with friends and family.” The primary participants also used text messaging to interact with work colleagues, classmates, teachers, personal aids, and members of their church. The majority of primary participants reported that they belonged to messaging groups, in particular church groups, as well as study groups, social groups, and support groups. The support groups typically consisted of members whom the primary participants had not met in person, a situation which they viewed as beneficial. Xolani remarked that messaging is a “platform for for [sic] verbal and non-verbal to interect [sic] and engage together,” thus highlighting the symmetry of these interactions. Primary participants also reported that they could not use text messaging to interact with certain communication partners because of age, language, and literacy barriers. Several commented that some of their older communication partners felt that text messaging was

"for the new generation" (Mayowa), to which Xolani reacted with regret because he could not use text messaging to interact with his parents. Tapiwa and Mayowa commented that the individuals with whom they interacted via text messaging had poor literacy skills, and Naleli's sister explained that Naleli's literacy skills also sometimes made it difficult to understand her; however, she did add that Naleli's literacy level was improving with the use of text messaging. The primary participants reported blocking unwanted communication partners and exiting from messaging groups in which they no longer wished to participate.

Communication Content

Our analysis also identified four sub-themes related to communication content: Range of topics, Functional orientation of topics, Privacy of interactions, and Expression of feelings/emotions. Primary and secondary participants reported talking about a wide range of topics, including private matters. Xolani noted that "[t]here are no restrictions in terms of what you talk abt [about] on WhatsApp" and Nomsa and Boipelo agreed. Xolani's friend and Naleli's sister commented that they discuss romantic interests with their respective primary participants. Most of the topics listed by the primary and secondary participants had a relational and not a transactional orientation. Primary participants commented that they were able to express their feelings and emotions using messaging. Xolani remarked that "I get to express myself more than I would infront [sic] of the people" and that "WhatsApp has made my voice more clear. Has conveyed my emotions and and [sic] feelings to people then [sic] I were to speak by myself." Elijah also commented that he was "free to talk" in the support groups on his mobile device as he did not know the other individuals in the group in person. Five of the seven primary participants felt strongly about the fact that their text messages were private and could not be viewed by others.

Primary participants used several expressive features in their text messages, including emojis. Favourites included those depicting laughter with tears, a sad face, eyes rolling, fist bump, and thumbs up. Nomsa's friend commented that Nomsa's use of emojis helped her to express herself. The primary participants also used language switching and informal colloquialisms like "iyeeeeh" (a positive exclamation used in different African languages) as well as accent stylizations such as "yeah" in their text messages.

Interaction Convenience

Four sub-themes were identified as relating to interaction convenience: Places conducive to interaction, Barriers related to place, Times conducive to interaction, and Barriers related to time. Messaging was considered convenient as it could be used at any time and in many settings. Most participants reported having their mobile phones with them at all times, except for Mayowa and Elijah, who were not allowed to use their phones at school or at work. Additional barriers to interaction convenience included the risk of theft when using a mobile device in public, as well as not being able to afford enough data. Naleli's sister lived in a separate home from Naleli and commented that messaging was a convenient way of keeping in touch with one another over a distance, as illustrated in the remark, "It makes me feel closer to her."

Ease and Rate of Interaction

The sub-themes pertaining to interaction ease and rate were variables influencing response rate, ease- and rate-enhancing strategies, and ease- and rate-enhancing device features. Using WhatsApp for text messaging on mobile devices allowed for the ease- and rate-enhancing features and strategies. Primary participants reported using the word prediction and spell-checker features on their phones and, to a lesser extent, the auto correct feature. They also sent brief text messages with little punctuation and enjoyed using shortened words that enhanced the ease and

rate of interaction (e.g., “wud” [what are you doing] and “jc” [just chilling]). Messaging was said to have “its own language” and according to the primary participants, spelling did not matter. Emojis were another element used to enhance the ease and rate of interaction (in addition to being used as an expressive feature). As Elijah remarked:

> [i]t's save time & energy. I don't need to write the whole full sentence like how was your day. I can say Hwud (how was your day) and it's [s*ic*] doesn't matter about the spelling of words. As long as the next person understand what you trying to say…Some people get the message better when see the pictures than through words [sic].

Two secondary participants commented that the urgency of the message influenced response rate.

Communication Maintenance and Repair of Breakdown

Communication maintenance and repair of breakdown comprised four sub-themes: Maintenance features, Breakdown frequency, Type of breakdown, and Repair strategies. WhatsApp was described by Xolani as “designed for conversation”, while Elijah commented that the app’s features, such as read receipts (blue ticks to show that a text message has been read), were very useful to maintaining interaction. The primary and secondary participants commented that although communication breakdowns sometimes occurred during text messaging, these were infrequent and easily repaired by asking for clarification or by sending a “?” In addition, certain messaging features were found to enhance the maintenance of communication. For instance, participants were able to post notifications if otherwise engaged, a messaging thread remained on the device, and there was the option of responding to older text messages within a thread.

Discussion

This study aimed to describe the interactional aspects of text messaging on mobile devices (related to the "why", "who", "what", "when", "where" and "how" of communication) for youth with complex communication needs. When discussing the themes that emerged from the results, the particular views of the primary participants were considered in conjunction with the observations of their abilities, the functionality of the smartphones they were using for text messages, the contexts within which these interactions took place, and the views highlighted by their communication partners. The integrated findings are discussed according to each of the research questions as well as in relation to the broader literature.

Why is text Messaging Liked (disliked)?

According to Caron and Light (2016), adults who use AAC report that it is easier expressing themselves through social media than in face-to-face interactions. Primary and secondary participants in the present study agreed and reported that it was easier for the primary participants to express themselves via WhatsApp text messaging. This fact is especially pertinent to our study, as the obtained speech intelligibility test scores of most primary participants were very low (see Table 1) and the researcher was unable to successfully interact with the primary participants without text messaging because they did not own dedicated communication devices. The importance of independent self-representation and self-expression in all areas of life is highlighted by numerous authors who have written about youth with complex communication needs (Hynan et al., 2015; McNaughton & Beukelman, 2010; McNaughton et al., 2012). The recognized anonymity afforded by text messaging that was highlighted by one of the participants in the current study as the reason for enhanced self-expression links to a study by Chib and Jiang

(2014). They found that when individuals with disabilities were able to manage their own personal identities on mobile phones, it helped them to escape the stigma of disability.

The main challenge reported by the primary and secondary participants in the current study was the cost of text messaging. According to Research ICT Africa (2017), the high cost of data in South Africa exceeds that in most leading economies in Africa and has led to the South African #DataMustFall campaign, which is hoping to address this issue.

Who are the Communication Partners?

Studies on the use of social media by individuals who use AAC have highlighted how various social media platforms and applications may increase their social connections (Caron & Light, 2016; Hynan et al., 2015), although such connections may not necessarily be with a wide variety of individuals. Following their investigation into training youth with complex communication needs to use social media, Grace et al. (2014) reported that the communication partners of these individuals were limited in number and mainly consisted of immediate family members and paid communication partners. Young adults between 24 and 30 years-of-age emphasized the importance of having a wide range of communication partners, in particular friends, and stated that a wide range of support networks decreases their feelings of loneliness (Cooper et al., 2009). In the present study, text messaging on mobile phones enabled the participants to interact with partners across all five circles described in the Social Networks Inventory of Blackstone and Hunt-Berg (2003) (i.e., lifelong communication partners, close friends and relatives, acquaintances, paid workers, and unfamiliar partners) and, according to both the primary and secondary participants, also helped to maintain and strengthen friendships. This online communication allowed the primary participants to have relationships that varied in intimacy, including frequent personal interactions with individuals they had not met in person.

Text messaging also allowed for group interaction, which is particularly poignant for youth with complex communication needs who may not have the opportunity to participate regularly in group-based activities (Raghavendra et al., 2012). Group interaction not only offered the primary participants support but also enabled them to give support and engage in their broader communities.

Text messaging affords a certain amount of symmetry between communication partners. Blackstone et al. (2007) attribute parity and symmetry to communication partners who are equal partners, who have the same communication time and resources, and who are able to express their authentic self – all of which may apply to text messaging. Although participants in the current study presented with physical disabilities affecting their mobility and speech intelligibility, they used the words “each other”, “one another” and “together” when describing their text-messaging interactions. The latter denotes symmetry and equality and shows that participants assumed an active role in interactions – not a passive role as some individuals with disabilities have been said to assume (Feeley & Jones, 2012). Participants also reported control over the exclusion of others, which provided them with a measure of agency over their text-messaging interactions. Furthermore, it must be noted that the choice of communication mode is partner-dependent (Blackstone et al., 2007; Blair et al., 2015) and the present study highlighted that not all communication partners with whom the participants interacted used text messaging, especially not the older individuals.

What is Communicated?

In a study by Bornman et al. (2016), persons who use AAC indicated that they used their mobile phones mainly for transactional purposes (such as making arrangements). The participants in the current study, however, reported that they used text messaging for chatting

about topics such as their interests (for example music and poetry), day-to-day experiences, relationships and love interests, the challenges they face, and their secrets. The nature of these interactions was reported by the primary as well as secondary participants to be mainly relational, rather than purely transactional.

Face-to-face interactions contain many nuances that are not necessarily obvious in text-based communication (McNaughton & Bryen, 2007). Nevertheless, the benefits of being able to use expressive features in text messages were highlighted by the participants in the current study. They enjoyed using expressive features such as emojis to indicate their emotions while messaging, for example the "eye-rolling" emoji. Having the means to use expressive features was particularly pertinent for these individuals, as limited motor control limited their options to use expressive features in face-to-face interactions. The secondary participants also reported that the emojis in the primary participants' messages helped them to understand how the primary participants felt.

Participants in the present study also used other emojis such as the "fist-bump" emoji, as well as language switching, informal expressions, and slang, thus, text messaging allowed them to express themselves in the language and style of their peers, which is an important consideration for adolescents (Bryen & Moolman, 2015) who wish to promote in-group identification (Smith, 2005; 2015).

When and Where do These Interactions Take Place?

In the present study, the researcher observed that the restricted mobility of certain primary participants placed constraints on their social participation. The participants also reported being restricted in their movements due to safety concerns and a lack of transport possibilities. This finding is in line with another South African study in which Masuku et al.

(2018) reported transportation barriers for individuals with disabilities. Because text messaging is a type of remote communication (Buchholz, 2019), it enabled participants in the present study to create a communication environment that transcends physical boundaries and connects them with individuals outside of their often-restricted settings. Text messaging also created for them a communication environment in which they could privately connect with communication partners, an important consideration for an individual in a group home or in an impoverished setting with no personal privacy. Text messaging thus established an "absent presence" (Thurlow & Poff, 2013, p. 167) between communication partners.

As previously mentioned, the advantages of asynchronous communication for individuals with disabilities have been highlighted by various authors (Blackstone et al., 2007; Paterson, 2017); however, text messaging, in particular mobile instant messaging, could also be used in a near synchronous way (Durkin et al., 2011). Participants used the word "chat" frequently when describing their use of text messaging. It was also observed that the participants interacted with various communication partners simultaneously.

How is Ease Enhanced and Communication Maintained?

All participants described text messaging as easy, even though they reported having difficulty with performing most fine motor tasks. It was evident that they were familiar with the operational requirements of their phones and used the ease- and rate-enhancing messaging features, along with ease- and rate-enhancing strategies. Keystroke saving as a result of word prediction accelerates the speed of expression and limits physical effort (Loncke, 2014), therefore, word prediction was highlighted as an important feature. The spell checker and auto correct features on the smartphones were also used by some of the participants. Although researchers such as Cooper et al. (2009) note that literacy difficulties are a potential barrier for

individuals with complex communication needs as well as their communication partners, the participants in the current study reported using text messaging to interact with partners despite limited literacy skills. Not only did they feel that text messaging could be used by individuals with varying literacy skills but they were also of the opinion that it could enhance literacy skills. The primary participants found it particularly advantageous that text messaging was brief and that language and spelling errors in the text messages were not frowned upon by others. This tolerance for language and spelling errors during computer-mediated communication was also reported by Hemsley et al. (2015), who investigated the use of Twitter™ by persons with disabilities in Australia.

It was evident from the study that text messaging was a favoured means of communication for youth with complex communication needs. Text messaging allowed them to participate in social interactions and gave them a sense of connectedness.

Implications for Clinical Practice

Although this study was conducted in South Africa (a low- and middle-income country) the clinical implications of the findings extend beyond the local context. According to Meder and Wegner (2015) it is essential for AAC service providers to have the necessary knowledge and skills to use mobile devices as an AAC system. Our study supports the findings of Meder and Wegner and informs service providers of the interactional aspects of text messaging and why this is regarded as an effective means of communication by youth with complex communication needs. It also emphasizes that service providers need to consider the individual, the device, and the context in which the activity of text messaging is used, and suggests that training in areas such as literacy development may be needed.

Our findings can also be used to advise other communication partners (such as family and friends) about their role in supporting the skills needed for text messaging, which, like all other communication skills, need to be modelled and practised (Alant, 2017). Furthermore, schools and work environments could be advised of the benefits that text messaging may have for youth with complex communication needs and encouraged to allow the use of text messaging in these environments.

Limitations and Future Directions

The most pertinent limitation of our study was the relatively small sample size and the fact that the primary participants may not have been representative of the larger population of persons with complex communication needs. This limitation specifically relates to the requirements that were set for literacy and access skills (direct selection on mobile devices). In addition, the vocabulary assessment did not bear any correlation to the findings, so that a normed in-depth literacy assessment suited to the specific population would have been beneficial.

The study may serve as a framework for further investigation into the amount of physical effort that youth with disabilities exert when using text messaging on mobile devices, the time required to compose and send a text message; as well as device features that reduce physical effort. The use of text messaging by youth with complex communication needs who have limited literacy skills and the possibility of developing and enhancing literacy skills through the use of text messaging (as suggested by the secondary participants) could also be investigated.

Furthermore, exploring the use of emojis, pictures, photographs, videos, stickers, and GIFs in text messaging can have significant intervention implications for the AAC field, as the primary participants in our study reported the importance of the use of visual images, an aspect also highlighted by Light and McNaughton (2014). Hemsley et al. (2017) also stressed the need

to collect and analyze data from social network sites. Similarly, analyzing the text message interactions among individuals with complex communication needs and their various communication partners would shed more light on these interactions.

Conclusion

According to Alant (2017, p. 12), ". . . relatively little attention has been paid to understand how individual AAC systems impact interactions between communication partners." The present study aimed to clarify the interactional aspects of text messaging for youth with complex communication needs. By exploring these aspects, numerous communication benefits of text messaging were highlighted by the participants, despite their varying physical and literacy skills. Text messaging played a significant role in the lives of the youth with complex communication needs who participated in this study, as it proved to be an easy means for them to meaningfully engage and connect with others. It also appears to have greatly increased their social participation.

References

Alant, E. (2017). *Augmentative and alternative communication: Engagement and participation.* San Diego, CA: Plural Publishing.

Agosto, D., & Abbas, J. (2012). Relationship and social rules: Teens' social network and other ICT selection practices. *Journal of the American Society for Information Science and Technology, 63*(6), 1108-1124. doi.org/10.1002/asi.22612

Baker, P. M. A., & Bellordre, C. (2004). Adoption of information technologies: Key policy issues, barriers and opportunities for people with disabilities. Paper presentation at the *37th Hawaii International Conference on System Sciences*. Big Island, HI, USA. doi.org/0-7695-2056-1/04

Barlott, T., Adams, K., & Cook, A. (2016). Increasing participation in the information society by people with disabilities and their families in lower-income countries using mainstream technologies. *Universal Access in the Information Society, 15*(2), 189-198. doi.org/10.1007/s10209-015-0418-z

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Review, 13*(4), 544-559. https://nsuworks.nova.edu/tqr/vol13/iss4/2

Blackstone, S. W., & Hunt Berg, M. (2003). *Social networks: A communication inventory for individuals with complex communication needs and their communication partners*. *Manual*. Augmentative Communication.

Blackstone, S. W., Williams, M. B., & Wilkins, D. P. (2007). Key principles underlying research and practice in AAC. *Augmentative and Alternative Communication*, *23*(3), 191-203. doi.org/10.1080/07434610701553684

Blair, B. L., Fletcher, A. C., & Gaskin, E. R. (2015). Cell phone decision making: Adolescents' perceptions of how and why they make the choice to text or call. *Youth and Society*, *47*(3), 395-411. doi.org/10.1177/0044118X13499594

Borg, J., Lantz, A., & Gulliksen, J. (2015). Accessibility to electronic communication for people with cognitive disabilities: A systematic search and review of empirical evidence. *Universal Access in the Information Society, 14*(4), 547-562. doi.org/10.1007/s10209-014-0351-6

Bornman, J., Bryen, D. N., Moolman, E., & Morris, J. (2016**)**. Use of consumer wireless devices by South Africans with severe communication disability. *African Journal of Disability, 5*(1). doi.org/10.4102/ajod.v5i1.202

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. doi.org/10.1191/1478088706qp063oa

Bryant, D. P. & Bryant, B. R. (2012). *Assistive technology for people with disabilities*. Boston, MA: Pearson Education.

Bryen, D. N., & Moolman, E. (2015). Mobile phone technology for ALL: Towards reducing the digital divide. In Z. Yan (Ed.), *Encyclopedia of Mobile Phone Behavior, 3,* 1456-1470. Hershey, PA: IGI Global. doi.org/10.4018/978-1-4666-8239-9.ch115

Buchholz, M. (2019). *Let's stay in touch! Remote communication for people with communicative and cognitive disabilities* (Doctoral thesis, University of Gothenburg, Gothenburg, Sweden).

Caron, J., & Light, J. (2016). Social media has opened a world of 'open communication': Experiences of adults with cerebral palsy who use augmentative and alternative

communication and social media. *Augmentative and Alternative Communication, 32*(1), 25-40. doi.org/10.3109/07434618.2015.1052887

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, A. (2014). The use of triangulation in qualitative research. *Oncology Nursing Forum, 41*(5), 545-547. doi.org/10.1188/14.ONF.545-547

Church, K., & de Oliveira, R. (2013). What's up with WhatsApp? Comparing mobile instant messaging behaviors with traditional SMS. *Mobile Human Computer Interaction with Mobile Devices and Services – Collaboration and Communication*, (pp. 352-361). Munich, Germany. doi.org/10.1145/2493190.2493225

Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *The Psychologist,* 26(2), 120–123.

Cook, A. M., & Hussey, S. M. (2002). *Assistive Technologies: Principles and Practice* (2nd ed.). St. Louis, MO: Mosby Elsevier.

Cooper, L., Balandin, S., & Trembath, D. (2009). The loneliness experiences of young adults with cerebral palsy who use alternative and augmentative communication. *Augmentative and Alternative Communication, 25*(3), 154-164. doi.org/10.1080/07434610903036785

Chib, A., & Jiang, Q. (2014). Investigating modern-day talaria: Mobile phones and the mobility-impaired in Singapore. *Journal of Computer-Mediated Communication, 19*(3), 695-711. doi.org/10.1111/jcc4.12070

Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed method approaches*. (4th ed.). Thousand Oaks, CA: Sage.

Creswell, J., & Poth, C. (2018). *Qualitative inquiry & research design: Choosing among five approaches* (4th ed.). Thousand Oaks, CA: Sage.

Darcy, S., Maxwell, H., & Green, J. (2016). Disability citizenship and independence through mobile technology? A study exploring adoption and use of a mobile technology platform. *Disability & Society*, *31*(4), 497-519. doi.org/10.1080/09687599.2016.1179172

Dunn, L. M., & Dunn, L. M. (2007). *PPVT-4: Peabody Picture Vocabulary Test* (4th ed.). Minneapolis, MN: Pearson Assessments.

Durkin, K., Conti-Ramsden, G., & Walker, A. J. (2011). Txt lang: Texting, textism use and literacy abilities in youths with and without specific language impairment. *Journal of Computer-Assisted Learning*, *27*(1), 49-57. doi.org/10.1111/j.1365-2729.2010.00397.x

Eliasson, A. C., Krumlinde-Sundholm, L., Rösblad, B., Beckung, E., Arner, M., Öhrvall, A-M., & Rosenbaum, P. L. (2006). The Manual Ability Classification System (MACS) for children with cerebral palsy. *Developmental Medicine and Child Neurology*, *48*(7), 549-554. doi.org/10.1017/S0012162206001162

Feeley, K. M., & Jones, E. A. (2012). Obtaining and maintaining communicative interactions. In S. S. Johnston, J. Reichle, K. M. Feeley, & E. A. Jones (Eds.), *AAC strategies for individuals with moderate to severe disabilities* (pp. 279-310). Baltimore, MD: Paul H. Brookes Publishing.

Grace, E., Raghavendra, P., Newman, L., Wood, D. & Connell, T. (2014). Learning to use the Internet and online social media: What is the effectiveness of home-based intervention for youth with complex communication needs? *Child Language Teaching and Therapy*, *30*(2), 141-157. doi.org/10.1177/0265659013518565

Grinter, R. E., Palen, L., & Eldridge, M. (2006). Chatting with teenagers: Considering the place of chat technologies in teen life. *ACM Transactions on Computer-Human Interaction*, *13*(4), 423-447. doi.org/10.1145/1188816.1188817

Harrison, H., Birks, M., Franklin, R., & Mills, J. (2017). Case study research: Foundations and methodological orientations. *Forum: Qualitative Social Research, 18*(1), Art. 19, http://nbn-resolving.de/urn:nbn:de:0114-fqs1701195

Hemsley, B., Balandin, S., Palmer, S., & Dann, S. (2017). A call for innovative social media research in the field of augmentative and alternative communication. *Augmentative and Alternative Communication, 33*(1), 14-22. doi.org/10.1080/07434618.2016.1273386

Hemsley, B., Dann, S., Palmer, S., Allan, M., & Balandin, S. (2015). 'We definitely need an audience': Experiences of Twitter, Twitter networks and tweet content in adults with severe communication disabilities who use augmentative and alternative communication (AAC). *Disability and Rehabilitation, 37*(17), 1531-1542. doi.org/10.3109/09638288.2015.1045990

Hynan, A., Goldbart, J., & Murray, J. (2015). A grounded theory of Internet and social media use by young people who use augmentative and alternative communication (AAC). *Disability and Rehabilitation, 37*(17), 1559-1575. doi.org/10.3109/09638288.2015.1056387

Hynan, A., Murray, J., & Goldbart, J. (2014). 'Happy and excited': Perceptions of using digital technology and social media by young people who use augmentative and alternative communication. *Child Language Teaching and Therapy, 30*(2), 175-186. doi.org/10.1177/0265659013519258

Kagohara, D. M., van der Meer, L., Ramdoss, S., O'Reilly, M. F., Lancioni, G. E., Davis, T. N., Rispoli, M., Lang, R., Marschik, P. B., Sutherland, D., Green, V. A., & Sigafoos, J. (2013). Using iPods® and iPads® in teaching programs for individuals with developmental disabilities: A systematic review. *Research in Developmental Disabilities, 34*(1), 147-156. doi.org/10.1016/j.ridd.2012.07.027

Kaufman, A. S., & Kaufman, N. L. (2004). *KBIT-2: Kaufman Brief Intelligence Test* (2nd ed.). San Antonio, TX: Pearson Assessments.

King, N., Horrocks, C., & Brooks, J. (2019). *Interviews in qualitative research* (2nd ed.). Thousand Oaks, CA: Sage.

Light, J., & McNaughton, D. B. (2014). Communication competence for individuals who require augmentative and alternative communication: A new definition for a new era of communication? *Augmentative and Alternative Communication, 30*(1), 1-18. doi.org/10.3109/07434618.2014.885080

Light, J., & McNaughton, D. (2015). Designing AAC research and intervention to improve outcomes for individuals with complex communication needs. *Augmentative and Alternative Communication, 31*(2), 85-96. doi.org/10.3109/07434618.2015.1036458

Ling, R. (2007). Children, youth and mobile communication. *Journal of Children and Media, 1*(1), 60-67. doi.org/10.1080/17482790601005173

Loncke, F. (2014). *Augmentative and Alternative Communication. Models and Applications for Educators, Speech-Language Pathologists, Psychologists, Caregivers, and Users*. San Diego, CA: Plural Publishing.

Masuku, K., Mophosho, M., & Tshabalala, M. (2018). 'i felt pain. deep pain…': Experiences of primary caregivers of stroke survivors with aphasia in a South African township. *African Journal of Disability, 7*, 1-7. doi.org/10.4102/ajod.v7i0.368

McNaughton, D. B., & Beukelman, D. R. (2010). *Transition Strategies for Adolescents & Young Adults who use AAC (AAC series)*. Baltimore, MD: Paul H. Brookes Publishing.

McNaughton, D. B., & Bryen, D. N. (2007). AAC technologies to enhance participation and access to meaningful societal roles for adolescents and adults with developmental

disabilities who require AAC. *Augmentative and Alternative Communication, 23*(3), 217-229. doi.org/10.1080/07434610701573856

McNaughton, D. B., Bryen, D. N., Blackstone, S., Williams, M., & Kennedy, P. (2012). Young adults with complex communication needs: Research and development in AAC for a "diverse" population. *Assistive Technology, 24*(1), 45-53. doi.org/10.1080/10400435.2011.648715

McNaughton, D. B., & Light, J. (2013). The iPad and mobile technology revolution: Benefits and challenges for individuals who require augmentative and alternative communication. *Augmentative and Alternative Communication, 29*(2), 107-116. doi.org/10.3109/07434618.2013.784930

Meder, A. M., & Wegner, J. R. (2015). iPads, mobile technologies, and communication applications: A survey of family wants, needs, and preferences. *Augmentative and Alternative Communication, 31*(1), 27-36. doi.org/10.3109/07434618.2014.995223

Morgan, D. L., & Lobe, B. (2011). Online Focus Groups. In S. N. Hesse-Biber (Ed.), *The Handbook of emergent technologies in social research* (pp. 199-230). Oxford, United Kingdom: Oxford University Press. https://www.researchgate.net/publication/273809338

Morris, J. T., & Bryen, D. N. (2015, March 21-26). *Use of mainstream wireless technology by adults who use AAC*. [Paper presentation]. International Technology and Persons with Disabilities Conference, San Diego, CA.

Niemeijer, D., Donnellan, A. M., & Robledo, J. A. (2012). *Taking the pulse of augmentative and alternative communication on iOS*. AssistiveWare. https://download.assistiveware.com/assistiveware/files/Taking%20the%20Pulse%20of%20AAC%20on%20iOS%20White%20Paper.pdf

Palisano, R., Rosenbaum, P. L., Bartlett, D., & Livingston, M. (2007). *Gross Motor Function Classification System - Expanded and Revised (GMFCS - E&R)*. CanChild. http://www.canchild.ca/en/resources/42-gross-motor-function-classification-system-expanded-revised-gmfcs-e-r

Paterson, H. L. (2017). The use of social media by adults with acquired conditions who use AAC: Current gaps and considerations in research. *Augmentative and Alternative Communication, 33*(1), 23-31. doi.org/10.1080/07434618.2016.1275789.

Pew Research Center (2019). *Smartphone ownership in advanced economies higher than in emerging*. https://www.pewresearch.org/global/2019/02/05/smartphone-ownership-is-growing-rapidly-around-the-world-but-not-always-equally/pg_global-technology-use-2018_2019-02-05_0-01/

Raghavendra, P., Olsson, C., Sampson, J. Mcinerney, R., & Connell, T. (2012). School participation and social networks of children with complex communication needs, physical disabilities, and typically developing peers. *Augmentative and Alternative Communication, 28*(1), 33-43. doi.org/10.3109/07434618.2011.653604

Reid, D., & Reid, F. (2004). *Insights into the social and psychological effects of SMS text messaging*. eBusinessforum. http://www.ebusinessforum.gr/old/content/downloads/Reidetal_SocialEffectsOfTextMessaging.pdf

Research ICT Africa. (2017). *Internet use barriers and user strategies: Perspectives from Kenya, Nigeria, South Africa and Rwanda*. https://researchictafrica.net/publications/Other_publications/

Salkind, N. J. (2006). *Exploring research* (6th ed.). Upper Saddle River, NJ: Pearson.

Schlosser, R. W. (2002). On the importance of being earnest about treatment integrity. *Augmentative and Alternative Communication, 18,* 36-44. doi.org/10.1080/aac.18.1.36.44

Shane, H. C., Laubscher, E., Schlosser, R. W., Flynn, S., Sorce, J. F., & Abramson, J. (2012). Applying technology to visually support language and communication in individuals with ASD. *Journal of Autism and Developmental Disorders*, *42,* 1228-1235. doi.org/10.1007/s10803-011-1304-z

Simons, H. (2017). *Mobile in SA Report 2017: Vodacom, Samsung have handy lead.* Memeburn. https://memeburn.com/2017/05/latest-mobile-south-africa-stats/

Smith, M. M. (2005). The dual challenges of aided communication and adolescents. *Augmentative and Alternative Communication, 21*(1), 67-79. https://doi.org/10.1080/10428190400006625

Smith, M. M. (2015). Adolescence and AAC: Intervention challenges and possible solutions. *Communication Disorders Quarterly, 36*(2), 112-118. doi.org/10.1177/1525740114539001

Thirumanickam, A., Raghavendra, P., & Olsson, C. (2011). Participation and social networks of school-age children with complex communication needs: A descriptive study. *Augmentative and Alternative Communication, 27*(3), 195-204. hdoi.org/10.3109/07434618.2011.610818

Thurlow, C., & Poff, M. (2013). Text messaging. In S. C. Herring, D. Stein, & T. Virtanen (Eds.), *Pragmatics of computer-mediated communication* (pp. 163-190). Berlin, Germany: Mouton de Gruyter. http://nl.ijs.si/janes/wp-content/uploads/2014/09/thurlowpoff11.pdf

Turner, A. (2015). Generation Z: Technology and social interest. *The Journal of Individual Psychology, 71*(2), 103-113. doi.org/10.1353/jip.2015.0021

United Nations Department of Economic and Social Affairs (2013). *Fact sheet definition of youth*. http://www.un.org/esa/socdev/documents/youth/fact-sheets/youth-definition.pdf

Van Niekerk, K., Dada, S., & Tönsing, K. (2019). Influences on selection of assistive technology for young children in South Africa: Perspectives from rehabilitation professionals. *Disability and Rehabilitation, 41*(8), 912-925. doi.org/10.1080/09638288.2017.1416500

Von Tetzchner, S., & Basil, C. (2011). Terminology and notation in written representations of conversations with augmentative and alternative communication. *Augmentative and Alternative Communication, 27*(3), 141-149. doi.org/10.3109/07434618.2011.610356

Wepener, C. (2019). *Mainstream mobile messaging for youth with complex communication needs: A South African case study exploring interactional aspects.* (Doctoral thesis, University of Pretoria, Pretoria, South Africa). http://hdl.handle.net/2263/73129

Wickenden, M. (2011). Talking to teenagers: Using anthropological methods to explore identity and the lifeworlds of young people who use AAC. *Communication Disorders Quarterly, 32*(3), 151-163. doi.org/10.1177/1525740109348792

Yin, R. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage.

Yin, R. (2013). Validity and generalization in future case study evaluations. *Evaluation, 19*(3), 321-332. doi.org/10.1177/1356389013497081

Yoon, C., Jeong, C., & Rolland, E. (2015). Understanding individual adoption of mobile instant messaging: A multiple perspectives approach. *Information Technology Management, 16*, 139-151. doi.org/10.1007/s10799-014-0202-4

Yorkston, K. M., & Beukelman, D. R. (1981). *Assessment of intelligibility of dysarthric speech*. Tigard, OR: C. C. Publications.

End Notes

[1]WhatsApp is an application owned by Facebook Inc., Menlo Park, CA.