

The Effect of Partner Reauditorization on Undergraduates' Attitudes Toward a Peer Who
Communicates with Augmentative and Alternative Communication

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Dedication

For Todd.

Abstract

Purpose: This study compared undergraduate college students' attitudes toward a similar-aged male peer who used a nonelectronic augmentative and alternative communication (AAC) system with and without a partner reauditorization strategy. The study also examined whether partner reauditorization was associated with reported increases in (a) ease of understanding the peer who used AAC, (b) willingness to engage in interactions with the peer who used AAC, and (c) preferences regarding the AAC systems.

Method: The independent variable for this study was the presence or absence of partner reauditorization. Sixty-four undergraduate female college students viewed a video of a peer who communicated using a nonelectronic AAC system in which the communication partner reauditorized the aided message, and a second video in which the message was not reauditorized. The sequence of videos was counterbalanced. The dependent variables were the participants' reported (a) attitudes toward the peer who used AAC, as well as reported (b) ease of understanding the peer, (c) willingness to engage in interaction with the peer, and (d) preferences regarding the AAC systems. After viewing each video, participants completed the Attitudes Toward Nonspeaking Persons survey (ATNP; Gorenflo & Gorenflo, 1991). Attitudes were measured using mean ratings from the ATNP. Participants also answered survey questions that were developed for this study, each of which utilized a five-point scale similar to the scale of the ATNP. Mean ratings from these original survey questions were used to measure reported ease of understanding

and willingness to engage in interaction with the peer who used AAC, as well as preferences about the AAC systems.

Results: Participants reported (a) more positive attitudes toward, (b) a greater ease in understanding, and (c) an increased willingness to interact with the peer who used nonelectronic AAC with partner reauditorization versus without partner reauditorization. The presence or absence of partner reauditorization did not influence reported preferences regarding AAC systems, however, a majority of participants reported a preference for an electronic speech-generating device over a nonelectronic AAC system. A majority of respondents commented that reauditorization contributed positively to the conversation shown in the video.

Conclusion: Partner reauditorization may play a role in improving attitudes that individuals hold about peers who use nonelectronic AAC. Partner reauditorization may also contribute to ease of understanding the aided message and increased likelihood of peer interactions.

Keywords: Reauditorization, augmentative and alternative communication, attitudes, preferences, AAC systems

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Chapter One: Introduction

Reauditorization is a communication partner's contingent spoken production of an augmentative and alternative communication (AAC) user's aided message (Beck, Fritz, Keller & Dennis, 2000; Bedrosian, Hoag, Calculator, Molineux, 1992). Reauditorizations are emitted by the AAC user's communication partner immediately after the AAC user produces an aided message. For example, if the speaking partner asked, "What did you do last night?" and the individual who uses AAC produced the aided reply, "I watched TV," the partner might reauditorize that message by speaking, "Oh, you were watching TV" (Bedrosian et al., 1992; Bedrosian, Hoag, Johnson, & Calculator, 1998; Beukelman & Mirenda, 2013).

Reauditorization has been promoted as an efficacious intervention strategy by the authoritative opinions of numerous highly respected researchers in the field of AAC for more than 25 years (e.g., Beck, Bock, Thompson, & Kosuwan, 2002; Bedrosian et al., 1998; Beukelman & Mirenda, 2012; Beukelman & Yorkston, 1982; Higginbotham, 1989; Mirenda & Bopp, 2003; Richter, Ball, Beukelman, Lasker, & Ullman, 2003). For the most part, reauditorization has been promoted as a strategy to improve the communication rate for people who use AAC in that it allows the AAC user to produce a short message that is promptly expanded by the speaking partner (Beukelman & Mirenda, 2012; Mirenda & Bopp, 2003). Reauditorization has also been purported to minimize communication breakdowns and aid in message transmission, which is also thought to enhance communication rate by reducing time spent resolving misunderstandings

(Beukelman & Yorkston, 1982; Fishman, Timler, & Yoder, 1985; Higginbotham, 1989; Mirinda & Bopp, 2003).

Despite reauditorization's promotion, no published, peer-reviewed studies have examined its efficacy. However, four investigations have examined reauditorization's effect on communicative partners' attitudes toward individuals who use AAC (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag & Bedrosian, 1992; Hoag, Bedrosian, Johnson, & Molineux, 1994). AAC researchers have long recognized the importance of studying the general public's attitudes toward persons who use AAC in an attempt to improve the social experiences of AAC users (e.g., Beck et al., 2002; Bedrosian et al., 1998; Richter et al., 2003). Given reauditorization's frequent use (Mirinda & Bopp, 2003), it is not surprising that its relationship to attitudes about AAC users has been considered.

However, each of the four existing studies have only examined reauditorization of speech generating devices (SGDs) which limits the application of these findings to other types of AAC (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag & Bedrosian, 1992; Hoag et al., 1994).

Effective communication requires a person to send a message, and one or more people to receive and comprehend the message. The capabilities, attitudes, and preferences of the sender *and* the recipients must be considered in order to optimize the effectiveness of communication among AAC users and help people select AAC systems that will best support successful communication interactions (McCarthy & Light, 2005; Richter, et al., 2003). To date, no published, peer-reviewed studies have examined the effect of reauditorizing nonelectronic AAC systems on message recipients' attitudes and

preferences. Several authors have suggested that additional research is needed in this area (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag & Bedrosian, 1992; Hoag et al., 1994). Figure 1 summarizes the history of reauditorization and provides a rationale for the continued examination of reauditorization.

[Insert Figure 1 Here]

The Present Study

The present investigation sought to expand the existing evidence base regarding how reauditorization influences communicative partner attitudes by examining the following four research questions:

(a) Do reported attitudes toward an individual who used a nonelectronic AAC system vary as a function of the presence or absence of partner reauditorization? It was hypothesized that reported attitudes toward individuals who used a nonelectronic AAC system would be more positive in the presence of partner reauditorization than in the absence of partner reauditorization. This hypothesis is based on outcomes of previous investigations in which attitudes have been more positive in the presence of voice output versus in the absence of voice output (Achmadi, van der Meer, Sigafos, Lancioni, O'Reilly, Lang et al., 2015; Lilienfeld and Alant, 2002).

(b) Does the reported ease of understanding the aided AAC message vary as a function of the presence or absence of a partner reauditorization strategy? Outcomes of previous studies have suggested that ease of understanding was rated more positively for AAC strategies that included voice output (Achmadi, et al., 2015; Richter et al., 2003). Consequently, it was hypothesized that undergraduate college students' reported ease of

understanding the aided AAC message would be more positive in the presence of partner reauditorization than in the absence of partner reauditorization.

(c) Does reported willingness to engage in a social interaction with the AAC user vary as a function of the presence or absence of a partner reauditorization strategy? It was hypothesized that undergraduate college students' willingness to engage in a social interaction with the AAC user would be more positive in the presence of partner reauditorization than in the absence of partner reauditorization. This hypothesis is based on outcomes of previous investigations in which attitudes have been more positive in the presence of voice output versus in the absence of voice output (Achmadi et al., 2015; Lilienfeld and Alant, 2002). As such, it is anticipated that willingness to engage in social interactions will be associated with more positive attitudes toward the person who uses AAC.

(d) Which type of AAC system, a nonelectronic paper-based communication board with reauditorization or a nonelectronic paper-based communication board without reauditorization, do undergraduate college students prefer for their own use, as well as for use by a potential communication partner? It is hypothesized that undergraduate college students' will report a preference for partner reauditorization versus the absence of partner reauditorization for their own as well as for others' use. This hypothesis is based on findings from previous studies in which a majority of participants indicated a preference for systems with voice output for themselves or others (Achmadi et al., 2015; Hyppa-Martin, Collins, Chen, Timinski, Amundsen, & Mizuko, 2016).

The next chapter will provide an in depth description of the importance of and

rationale for examining the attitudes that potential communicative partners hold toward individuals who use AAC. A systematic review of literature on attitudes and AAC will be presented, and the four existing studies that empirically examined reauditorization will be described.

Chapter Two: Literature Review

It is estimated that between 2 and 2.5 million individuals in the US have communication disabilities so severe that speech is not a functional primary communication mode (ASHA, 2015; Beukelman & Mirenda, 2013). Individuals with severe communication disabilities often rely on aided augmentative and alternative communication (AAC) systems that include communication books, boards, and devices (Beukelman & Mirenda, 2013; Johnston, Reichle, Feeley, & Jones, 2012; McCarthy & Light, 2005). These systems are designed to improve communication function and independence. However, persons relying on aided communication have experienced negative attitudes and behaviors from others in their social environment (Kent-Walsh & Light, 2003; Kraus, 1995; McCarthy & Light, 2005; McNaughton, Light, & Arnold, 2002; Shaver, Curtis, & Strong, 1989). As such, it is important to understand how AAC interventions might not only increase communicative independence, but also support more positive social experiences for persons who use AAC (ASHA, 2015; Batorowicz, Campbell, Von Tetzchner, King, & Missiuna, 2014; Beukelman & Mirenda, 2013; McCarthy & Light, 2005).

Social Validation of AAC Interventions

Social validation has been described as measuring the acceptability of an AAC intervention from the perspective of individuals who interact with, or would potentially interact with, persons who use AAC (Snell, Brady, McLean, Ogletree, Siegel, Sylvester, et al., 2010). Social validation involves assessing the social significance of intervention methods and outcomes by using an appropriate measurement tool to describe the

subjective experience of relevant stakeholders with respect to the intervention component in question (Schlosser, 1999, 2003). Examinations of social validity of AAC interventions have involved measuring the attitudes of the general public toward individuals who use aided communication strategies (McCarthy & Light, 2005). Research pertaining to attitudes that individuals hold toward persons who use AAC has a long history and has been reported in more than 25 peer-reviewed investigations during the past 25 years (e.g., Beck et al., 2002; Blockberger, Armstrong, O'Connor, & Freeman, 1993; Gorenflo & Gorenflo, 1991; Hyppa-Martin et al., 2016; Lilienfeld & Alant, 2002; Richter et al., 2003).

Summary of Research on Attitudes Towards Individuals Who Use AAC

An attitude refers to a person's psychological tendency to evaluate a particular entity with a degree of favor or disfavor (Eagly & Chaiken, 1993, 2007). Attitudes have been described as consisting of the interaction of behaviors (e.g., actions and intents), feelings (e.g., affect and emotions), and thoughts (e.g., ideas and beliefs) (Beck, Thompson, Kosuwan, & Prochnow, 2010; Eagly & Chaiken, 2007; Triandis, 1971). Peoples' attitudes are associated with the way they respond to certain social situations because attitudes predispose people to a corresponding class of actions (Eagly & Chaiken, 2007; Kraus, 1995; McCarthy & Light, 2005; Triandis, 1971). That is, attitudes often relate in a predictable way to the attitude holder's social behavior (McCarthy & Light, 2005; McCarthy, Donofrio-Horowitz, & Smucker, 2010). Historically, negative attitudes have been reported toward individuals with disabilities (Kent-Walsh & Light, 2003; Kraus, 1995; McCarthy & Light, 2005; Shaver et al., 1989).

Practitioners have an interest in recommending AAC interventions, from the available options, that are associated with more favorable attitudes towards individuals who use AAC (Schlosser, 2003). Negative attitudes toward persons who use AAC may result in actions that intentionally or unintentionally create communication barriers (Beukelman & Mirenda, 2013; McCarthy & Light, 2005) that could potentially hinder life experiences for persons who use AAC (McCarthy & Light, 2005). For example, among educators, negative attitudes toward persons who use AAC may create barriers to inclusion and contribute to poor educational outcomes (Dada & Alant, 2002; McCarthy & Light, 2005; Soto, 1997). Negative attitudes among potential employers may influence hiring practices that limit employment opportunities for persons who use AAC (McCarthy & Light, 2005; McNaughton & Bryen, 2002; Unger, 2002). Negative attitudes among peers of persons who use AAC systems may result in fewer opportunities to engage in social interactions and may, in turn, limit interpersonal social relationships (McCarthy & Light, 2005).

Factors that influence attitudes toward individuals who use AAC. McCarthy and Light (2005) summarized the extant evidence about attitudes toward individuals who use *aided* AAC. *Aided* AAC refers specifically to AAC systems that are external to the individual's person (ASHA, 2015; Beukelman & Mirenda, 2013; Johnston et al., 2012). Aided AAC includes speech-generating devices (SGDs), communication books, cards, and boards (ASHA, 2015; Beukelman & Mirenda, 2013; Johnston et al., 2012). Aided AAC serves as the focus of the empirical evidence that will be subsequently summarized.

Three general categories of factors have been explored as potential influences on

attitudes toward individuals who use aided AAC (McCarthy & Light, 2005). These include (a) how the characteristics of the persons reporting their attitudes (hereafter referred to as *respondents*) influenced reported attitudes (e.g., respondent familiarity with persons with disabilities, respondent gender); (b) how the characteristics of the individual who used AAC influenced reported attitudes (e.g., whether the person using AAC had additional physical disabilities, his or her age); and (c) how the characteristics of the AAC system itself influenced reported attitudes (e.g., whether the AAC system was nonelectronic versus electronic, digitized versus synthesized).

More than 10 years has passed since McCarthy and Light's (2005) review. Consequently, a systematic literature search was conducted to locate more recent investigations studying reported attitudes toward persons who use AAC. Based on Eagly and Chaiken's (1993, 2007) definition of attitude, a study was considered to examine attitudes if study procedures (a) required respondents to evaluate an AAC user or group of AAC users, and (b) specifically queried respondents about the thoughts, feelings, or behaviors they would direct toward the AAC user or users who served as the referent. Six electronic databases that index peer reviewed articles pertaining to speech language pathology and special education (i.e., Academic Search Premier, Academic OneFile, ProQuest Dissertations and Theses, ERIC Proquest, PsychInfo, and PubMed) were systematically searched with combination of the key words *attitude* or *attitudes* plus *augmentative and alternative communication* or *augmentative communication* to locate research that met the following criteria: (a) included measures of attitudes toward a specific individual or group individuals who used aided AAC; (b) were peer-reviewed

and published or completed as a part of a doctoral dissertation between 1980 and May 2016; (c) were written in English. An archival search was conducted of the *Journal of Augmentative and Alternative Communication* using the same criteria because a majority of articles yielded by the database search had been published in this journal. An ancestral search was subsequently conducted using the reference lists of all of the studies meeting the above criteria. Dissertations were excluded if they were also published as a peer-reviewed article that met inclusion criteria (e.g., Gorenflo, 1986). These criteria and search procedures were similar to those applied in the review on this topic by McCarthy and Light (2005), and yielded the same 13 studies that were included in that review, plus 17 additional studies, resulting in a total of 30 publications meeting inclusion criteria (Table 1 presents a summary).

These 30 studies identify conditions that might affect AAC users' societal participation by describing the attitudes that people hold toward individuals who use aided AAC. Most of the yielded studies required respondents to view one or more video recordings depicting a conversation between an individual who used AAC and a communication partner (e.g., Beck et al., 2002; Blockberger et al., 1993; Hyppa-Martin et al., 2016; Lilienfeld & Alant, 2002) or to read information about an individual who uses AAC (e.g., Hoag & Bedrosian, 1992; Kanarowski, 2012). In all cases, respondents then completed a survey about his or her attitudes toward the AAC user.

Characteristics of respondents and characteristics of the individual who used AAC. Of the three aforementioned categories of independent variables (i.e., respondent characteristics, characteristics of the individual who used AAC, and characteristics of the

AAC system), findings across studies were similar with respect to characteristics of the respondents and the characteristics of the individual who used aided AAC. For example, female respondents tended to report more positive attitudes toward AAC users than male respondents (Beck et al., 2002; Blockberger et al., 1993; Lilienfeld & Alant, 2002).

Respondents who were more familiar with people with disabilities tended to report more positive attitudes toward people who use AAC than those who were less familiar with them (Beck & Dennis, 1996; Beck et al., 2001; Gorenflo & Gorenflo, 1991).

Respondents' attitudes tended to be more negative as a function of chronological age among first, third, and fifth grade respondents (Beck, Fritz et al., 2000). By contrast, improved judgments of AAC user competence and increased perceived similarity with the individual who used AAC were associated with more positive attitudes among respondents (Beck, Kingsbury, Neff, & Dennis, 2000; Beck, Thompson, Clay, Hutchins, Vogt, Romaniak, & Sokolowski, 2001; Beck et al., 2002; Gorenflo & Gorenflo, 1997).

Characteristics of the AAC system. The manner in which the third category of independent variables (i.e., characteristics of the AAC system) impacted respondents' attitudes has been somewhat less consistent across investigations. For example, SGDs have been compared to non-electronic AAC systems (e.g., paper communication boards) several times (e.g., Achmadi et al., 2015; Beck & Dennis, 1996; Beck et al., 2001; Beck et al., 2010; Beck, Fritz et al., 2000; Blockberger et al., 1993; Dada & Alant, 2002; Gorenflo & Gorenflo, 1991; Hyppa-Martin et al., 2016; Macke, 1992). In a majority of these investigations, respondents' attitudes regarding the individual using AAC did not vary as a function of whether the system was an SGD and produced voice output, or

whether the system was nonelectronic and/or did not produce voice output (e.g., Beck & Dennis, 1996; Beck, Fritz et al., 2000; Beck et al., 2001; Beck et al., 2002; Blockberger et al., 1993). However, in three studies respondents reported more positive attitudes toward individuals who used SGDs when compared with nonelectronic AAC systems (Gorenflo & Gorenflo, 1991; Lilienfeld & Alant, 2002; Macke, 1992).

Specifically, Lilienfeld and Alant (2002) found that children from 11 to 13 years of age reported more positive attitudes toward a 13-year-old peer with cerebral palsy when he used an SGD, rather than a nonelectronic communication board. Gorenflo & Gorenflo (1991) reported that undergraduate college students' attitudes were more positive toward a 22-year-old male with cerebral palsy when he used an SGD, as opposed to a nonelectronic communication board. Similarly, Macke (1992) found that undergraduate special education students reported more positive attitudes toward a boy with cerebral palsy when he used an SGD instead of a non-electronic communication board.

Definition and Purpose of Reauditorization

As briefly summarized in the first chapter, reauditorization is a contingent spoken expansion of an AAC user's message that is produced by the AAC user's communication partner (Beck, Fritz, et al., 2000; Bedrosian et al., 1992). More specifically, reauditorized messages (a) are spoken by the partner immediately after the individual who uses AAC produces an aided message; (b) may involve a verb tense change; and (c) are not typically spoken with rising intonation (Bedrosian et al., 1992; Bedrosian et al., 1998; Beukelman & Mirenda, 2012; Hoag & Bedrosian, 1992). For example, if the speaking partner asked,

“What did you do last night?” and the individual who uses AAC produced the aided message, “I watched TV,” the partner might reauditorize that message by speaking, “Oh, you were watching TV.” The partner would then continue with his or her own conversational turn by saying, for example, “I bet you were watching late night classics. That’s a nice way to spend an evening” (Bedrosian et al., 1992; Bedrosian et al., 1998; Beukelman & Mirenda, 2012).

Reauditorization has been promoted as a strategy for use by the communication partners of AAC users that is said to (a) enhance the communication rate of the individual using AAC by requiring only a telegraphic production from an AAC user (Beukelman & Yorkston, 1982); (b) prevent communication breakdowns by allowing the partner to confirm the aided AAC message by reauditorizing before responding to it, thus giving the individual who uses AAC time to reject the reauditorization if it was incorrect (Beukelman & Yorkston, 1982; Fishman, Timler, & Yoder, 1985; Higginbotham, 1989); (c) increase intelligibility of a message by making it more complete than a telegraphic production by the AAC user (Mirenda & Bopp, 2003); and (d) convey the message that was produced by the person using AAC to other observers in the environment who are unable to see an aided nonelectronic message or hear a message produced via aided synthesized or digitized voice output (Beck, Fritz, et al., 2000).

Reauditorization has been endorsed as an efficacious intervention strategy via authoritative opinions offered by a number of AAC researchers and has been in widespread use for more than 25 years (e.g., Beck et al., 2002; Bedrosian et al., 1998; Beukelman & Mirenda, 2012; Beukelman & Yorkston, 1982; Higginbotham, 1989;

Mirenda & Bopp, 2003; Richter et al., 2003). The common use of reauditorization (Mirenda & Bopp, 2003) enhances the importance of better understanding its effect on attitudes towards AAC users who engage in interactions employing this strategy.

Attitudes Regarding Reauditorization

Sixteen of the 30 studies yielded as a result of the present systematic search did not directly contribute to the evidence about reauditorization. For example, reauditorization was irrelevant to studies in which respondents were only given a written description of an AAC user because there was no communication partner involved and, therefore, no reauditorization (e.g., Kanarowski, 2012; McCarthy et al., 2010; Raney & Silverman, 1992). In several other studies, reauditorization was not specifically discussed in the procedure so it is unclear what role it may have played in the study's procedures (e.g., Dudek, Beck, & Thompson, 2006; Gorenflo & Gorenflo, 1991; Kim, Kim, Lee & Park, 2015; McCoy, Bedrosian, Hoag, & Johnson, 2007). However, reauditorization played a role in 14 out of the 30 published experiments that were designed to measure attitudes toward persons who use AAC. These 14 studies cluster into three groups.

Reauditorization was (a) isolated as an independent variable in four studies (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag & Bedrosian, 1992; Hoag et al., 1994); (b) used as part of study procedures, but was not an independent variable, in eight studies (Beck & Dennis, 1996; Beck, Kingsbury et al., 2000; Beck et al., 2001; Beck et al., 2002; Beck, Fritz et al., 2000; Blockberger et al., 1993; Hyppa-Martin et al., 2016; Richter et al., 2003) and (c) was neither an independent variable, nor implemented in study procedures, in two studies (Lilienfeld & Alant, 2002; Achmadi et al., 2015). Lilienfeld & Alant

(2002) specifically stated that reauditorization was not employed and Achmadi et al. (2015) provided a transcript which clarified that reauditorization was not employed by the communication partner. Each of these three groups of studies and the implications of their findings will be summarized next.

Reauditorization as an independent variable. Reauditorization was examined as an independent variable in four of the 30 studies pertaining to attitudes toward persons who use aided AAC (i.e., Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992). All four studies examined whether reauditorizations by the communication partner influenced the attitudes of respondents who viewed videotaped interactions of conversations between an individual who used AAC and a partner who spoke. In each of these four studies, the presence or absence of reauditorization was not associated with differences in the respondents' reported attitudes toward the individual who used AAC. However, this may have been due to the methodological choices made by the researchers, which will be described next.

All four studies (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992) involved respondents viewing a video recording of a conversation in which the individual who used AAC used a speech-generating device (SGD) that was reauditorized in one condition, and was not reauditorized in the other condition. Bedrosian et al. (1992) concluded that the lack of an effect for reauditorization on listeners' judgments about the AAC user might be due to the fact that voice output from an SGD was present in all conditions. That is, in the non-reauditorized conditions the respondents still received auditory information about the aided AAC message via the

SGD's voice output. Consequently, similar auditory information reached the respondents regardless of whether reauditorization was present or absent. This procedure may have equated the conditions and contributed to the lack of an effect. Bedrosian et al. (1992) suggested that reauditorization may have an effect when the intelligibility of the speech produced by an SGD is reduced or when a nonelectronic AAC system with no voice output is used.

Reauditorization used in study procedures. Eight of these 30 studies (Beck et al., 1996; Beck, et al., 2000; Beck et al., 2001; Beck et al., 2002; Beck, Fritz et al., 2000; Blockberger et al., 1993; Hyppa-Martin et al., 2016; Richter et al., 2003) isolated an aspect of the AAC system as an independent variable and implemented reauditorization in experimental procedures. None of these studies treated reauditorization as an independent variable. In all of these cases, when a study's independent variable was a characteristic of the AAC system (e.g., whether the AAC system was non-electronic and/or had no voice output versus an SGD with voice output; whether the AAC system had synthesized versus digitized voice output) and procedures included reauditorization, a main effect for the independent variable involving the AAC system was not detected.

Similar to each study in the previous group, studies in this group also required participants to view videotaped interactions of a conversation between an individual who used AAC and a partner who communicated via natural speech. For example, Richter et al. (2003) examined attitudes toward an adult with dysarthria and amyotrophic lateral sclerosis who used either non-electronic AAC or an SGD. Hyppa-Martin et al. (2016) explored attitudes toward a 6 year old who used either nonelectronic AAC or an SGD. In

both studies, the communicative partner reauditorized *only in the non-electronic condition*. By contrast, Beck, Fritz, et al. (2000) examined the attitudes of typically developing first, third, and fifth graders toward a peer who used AAC. In these two studies, partners reauditorized *in both conditions* that were being compared. Similar methods were used in the remainder of the studies in this category (i.e., Beck & Dennis, 1996; Beck et al., 2001; Beck et al., 2002). Consequently, relatively equivalent auditory information reached the listeners in all conditions of all of these studies, regardless of the AAC system characteristic that was isolated as the study's independent variable. For each of these eight studies, no main effects for AAC system were detected. It is possible that the use of reauditorization in these studies' procedures equated the auditory information reaching the respondents, minimized the perceived differences between the conditions, and contributed to the lack of a detectable effect of the independent variable.

Reauditorization not used in study procedures. Two studies examined attitudes toward persons who used AAC in which reauditorization was neither isolated as an independent variable, nor was it implemented as a part of the studies' procedures (Lilienfeld & Alant, 2002; Achmadi et al., 2015). Both studies examined whether respondents' reported attitudes varied when the individual communicated with an SGD versus a non-voice output AAC system.

Lilienfeld and Alant (2002) surveyed 115 adolescents aged 11 to 13 years after they viewed a video of two of their peers having a conversation. Similar to the videos used in previously described studies, the AAC user had cerebral palsy and used an aided AAC system. The communication partner was typically developing and used natural speech. In

an attempt to compare the attitudes of children toward an AAC user who communicated with an SGD compared to a device without speech output, one video depicted the individual who used a SGD conversing with a partner. In the other video, the identical conversation occurred but the AAC system did not produce voice output.

Reauditorization was not implemented in either condition. In this case, respondents reported more positive attitudes toward the peer using the SGD versus the non-voice output device (Lilienfeld & Alant, 2002).

Achmadi et al. (2015) surveyed 104 undergraduate college students after they viewed a video in which a typically developing peer who used natural speech communicated with an individual who used aided AAC. Both individuals depicted in the video were typically developing adult female actors role-playing the conversational partners, and no attempt was made to portray the individual who uses AAC as having any additional disabilities. In one video, the AAC user communicated with an SGD. In another video, the AAC user communicated with a non-electronic AAC system with no voice output. The same communication exchange occurred in each condition between the same partners. Reauditorization was not implemented in any condition. The respondents rated the AAC user more positively when an SGD was used, rather than the nonelectronic AAC system (Achmadi et al., 2015).

Reauditorization lacks empirical support. As mentioned previously, reauditorization has been promoted by a number of AAC researchers for more than two decades (Beck et al., 2002; Bedrosian et al., 1998; Beukelman & Mirenda, 2013; Beukelman & Yorkston, 1982; Higginbotham, 1989; Mirenda & Bopp, 2003, Richter et

al., 2003). However, with the exception of several case examples and anecdotal accounts (Mirenda & Bopp, 2003) there is an absence of evidence to support reauditorization's efficaciousness with respect to enhancing the rate of AAC message production, preventing communication breakdowns, increasing intelligibility of a message, or conveying the message to others in the environment (Mirenda & Bopp, 2003; Beukelman & Mirenda, 2013).

To review the existing evidence supporting reauditorization, the same six databases that were used in the previous search (i.e., Academic Search Premier, Academic OneFile, ProQuest Dissertations and Theses, ERIC Proquest, PsychInfo, and PubMed) were again systematically searched using the terms *reauditorization* and *re-auditorization*. The same terms were used to conduct an archival search of *Augmentative and Alternative Communication*. This search yielded no studies that explored whether reauditorization improves communication rate, intelligibility, ability to prevent communication breakdowns, or any other aspect of effectiveness or efficaciousness.

The need for efficacy and social validity investigations of reauditorization.

Given the long history of reauditorization's use and the negative attitudes and behaviors that have been directed toward people with disabilities (Bedrosian et al., 1998; Kraus, 1995; McCarthy & Light, 2005; Shaver et al., 1989), an examination of reauditorization is warranted both from a standpoint of efficaciousness (e.g., as a rate or intelligibility enhancement strategy) and social validity (e.g., its effect on attitudes of potential communication partners toward the individual who uses AAC). The inability to speak intelligibly and the presence of external AAC aids commonly used with reauditorization

can make an individual's communication disability somewhat obvious. As such, it is not surprising that reauditorization's impact on attitudes toward AAC users has been questioned (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992). However, the four investigations examining reauditorization's role in influencing people's judgments about individuals who use AAC systems have focused solely on SGDs (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992).

Specifically, the role of partner reauditorization of nonelectronic AAC interventions remains potentially problematic, because its effect on the attitudes toward persons who use this type of AAC is unclear. To date, no empirical investigations have reported more positive attitudes toward individuals using non-electronic systems compared to SGDs (McCarthy & Light, 2005). However, non-electronic aided AAC systems are still frequently incorporated in evidence-based AAC interventions for individuals with communication disabilities across the lifespan (ASHA, 2015; Boesch, Wendt, Subramanian, & Hsu, 2013; McLay, van der Meer, Schafer, Couper, McKenzie, & O'Reilly et al., 2015; Wong, Odom, Hume, Cox, Fettig, Kucharczyk, et al., 2015). A recent survey indicated that more than ten percent of speech-language pathologists (SLPs) reported that between one and 15 adults on their caseloads routinely used non-electronic AAC systems (King, 2015), and even individuals who have SGDs use nonelectronic AAC systems when SGDs are charging, undergoing maintenance, or simply not the device of choice for the context (Beukelman & Mirenda, 2013; Blackstone & Hung-Berg, 2003). Consequently, non-electronic AAC systems continue to play an

important role in interventions for persons who use AAC even though they have not been associated with more positive attitudes toward an AAC user.

Research involving partner reauditorization can be summarized as follows:

(a) in cases where reauditorization of an SGD's voice output was isolated as an independent variable, reauditorization has not been found to influence attitudes toward AAC users; (b) when a characteristic of an AAC system was isolated as an independent variable and reauditorization *was used* in a non-voice output condition or in both conditions being compared, the independent variable had *no effect* on reported attitudes toward an individual who used AAC; (c) when a characteristic of an AAC system was isolated as an independent variable and reauditorization *was not used* in the non-voice output condition, there *was a difference* between the reported attitudes toward the individual who used AAC. However, the latter methodology was only used in two studies (i.e., Achmadi et al., 2015; Lilienfeld & Alant, 2002), neither of which isolated reauditorization as an independent variable. Given this pattern in previous outcomes, it is possible that reauditorization of nonelectronic AAC productions could be associated with improved attitudes toward an AAC user. The evidence base is both ready for and in need of expansion.

Summary

Given the limited existing evidence regarding reauditorization, the common use of nonelectronic AAC systems, and the importance of clarifying how AAC system characteristics influence attitudes of potential communication partners, a necessary next step is to examine the effect of reauditorization of nonelectronic AAC on attitudes toward

AAC users. Obviously, nonelectronic AAC systems do not produce voice output. Unlike output from the SGDs used in previous studies examining reauditorization (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992), the content of a nonelectronic aided AAC message is not automatically disambiguated by an auditory signal, and does not reach observers in the environment who do not have a direct line of sight to the AAC display (Johnston et al., 2012). The lack of spoken output from nonelectronic systems, and the subsequent inability of third-party observers to comprehend the nonelectronic aided message that is not within their direct line of sight, has been suggested as a reason that no investigations to date have reported more positive attitudes toward individuals using nonelectronic systems than SGDs (Bedrosian, et al., 1992).

A well-controlled examination of the effect of reauditorization on peer attitudes toward an individual who uses nonelectronic AAC is important for a number of reasons. First, as previously mentioned, reauditorization has been promoted via authoritative opinion for more than 25 years (Beukelman & Mirenda, 2013; Beukelman & Yorkston, 1982; Higginbotham, 1989; Mirenda & Bopp, 2003). Second, nonelectronic aided AAC systems are used by people with severe communication disabilities across the lifespan, even by persons who also use electronic AAC systems like SGDs (ASHA, 2015; Beukelman & Mirenda, 2013). Consequently, findings about reauditorization of nonelectronic systems could affect a large population of individuals who currently use aided AAC. Third, only four studies have isolated reauditorization as an independent variable (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag &

Bedrosian, 1992). These studies limited their investigation to the reauditorization of SGDs, thus, the similar auditory signal reaching respondents in all conditions may have contributed to the lack of a measurable effect for the reauditorization variable. Finally, if an examination of reauditorization reveals that it is associated with more positive reported attitudes, interventionists could increase their confidence about the social acceptance of the strategy. On the other hand, no effect of reauditorization on reported attitudes and judgments would corroborate the findings of the previous four experiments that did not directly control the auditory signal in examining reauditorization (i.e., Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992).

Appropriate next steps involve examining attitudes of respondents toward an individual who uses a nonelectronic AAC system (a) with partner reauditorization versus (b) without partner reauditorization. Additionally, while investigations into people's attitudes toward individuals who use AAC have been examined several times over the last three decades (McCarthy & Light, 2005), judgments about preferences regarding the type of AAC system have not been as widely explored (Ganz, 2014; Light, Page, Curran, Pitkin, 2007; McNaughton & Light, 2013; Rummel-Hudson, 2011; van der Meer, Sigafoos, O'Reilly & Lancioni, 2011; Williams, Krezman, & McNaughton, 2008). Understanding the preferences of peers and other communication partners, as well as these potential communication partners' willingness to interact with the AAC user, could also help identify characteristics of AAC systems that support the acceptance of AAC and promote the positive view of its use by potential communication partners (Achmadi

et al., 2015). Consequently, a secondary purpose of the study is to examine whether preference and reported willingness to socially interact with the AAC user vary as a function of the presence or absence of partner reauditorization. Finally, it has been suggested that reauditorization is more likely to have an effect on attitudes when the AAC system being used is less intelligible to observers resulting in reduced ease of understanding and reduced comprehensibility (Bedrosian, et al., 1992). Consequently, the present study will also examine whether reported ease of understanding varies as a function of the presence or absence of reauditorization.

Chapter Three: Method

Participants

Participants included 64 female undergraduate students, 18 to 27 years of age (M years = 19.0, $SD=1.2$), who attended a university in the Midwestern US. Academic major and other demographic information is provided in Table 2. Undergraduates were selected because they are representative of an educated non-specialist (Achmadi et al., 2015). They are unlikely to have extensive experience interacting with individuals who use AAC or to have received specialized training in AAC. Undergraduates' attitudes may reflect those commensurate with parents, families, and home communities (Chickering & Reisser, 1993; Pascarella & Terenzini, 2005). In the future, undergraduate students are likely to serve in a variety of roles in which their attitudes may impact persons who use AAC (e.g., future employers, coworkers, educators, administrators, and lawmakers). Consequently, the attitudes of undergraduate students could potentially create or prevent barriers for persons who use AAC (Achmadi et al., 2015).

As stated previously, gender has been consistently reported as a significant factor that influences attitudes towards people who use AAC (Beck et al., 2001; Beck et al., 2010; Beck & Dennis; 1996; Beck, Kingsbury et al., 2000; Blockberger et al., 1993; Dada & Alant, 2002); therefore, gender represents a potential moderator in an analysis of preferences and attitudes. By only including female respondents, the present study removed the potential for gender effect.

Inclusion criteria. All participants met the following inclusion criteria: (a) enrolled in an introductory-level communication disorders course at a university; (b) provided consent; (c) reported no more than five hours training on AAC; (d) reported a history of

typical development with no disabilities; and (e) competently understood and spoke English (per university entrance requirements).

Design and Procedural Overview

A randomized complete block design within participants was implemented to compare participants' responses to survey items that examined reported (a) attitudes toward the AAC user; (b) ease of understanding the AAC user; (c) willingness to interact with the AAC user; and (d) preferences for use of an AAC system by self and by others. All participants (n=64) completed both experimental conditions (i.e., reauditorization and no reauditorization). Mean scores for survey items were compared across conditions to explore whether the presence or absence of reauditorization was associated with differences in responses.

Independent variable.

The use of a nonelectronic AAC system with reauditorization versus without reauditorization served as the independent variable. Reauditorization was operationally defined as the communication partner's contingent spoken expansion of the message produced by the individual who used non-electronic aided AAC (Beck, Fritz et al., 2000; Bedrosian et al., 1992) that was (a) spoken by the AAC user's communication partner immediately after the individual who used AAC produced the aided message, (b) may have involved a verb tense change, and (c) was not spoken with rising intonation (Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992).

Dependent variables.

Dependent variables included: (a) the mean score on the *Attitudes Toward Nonspeaking Persons* scale (ATNP; Gorenflo & Gorenflo, 1991); (b) the mean score on the three survey items pertaining to ease of understanding (i.e., the responses to items 1, 11, and 12 in Appendix D); (c) the score on the two survey items pertaining to willingness to interact (i.e., the responses to items 5 and 6 in Appendix D); and (d) the mean rating on the survey items examining preference for self use (i.e., the response to item 2 in Appendix D) and others' use (i.e., the response to item 3 in Appendix D).

Power analysis.

The randomized complete block design within participants was used to maximize effective sample size by allowing all participants to complete both experimental conditions. All participants viewed two video recorded conversations, one with and one without reauditorization. The conditions were counterbalanced. Participants were randomly assigned to one of two groups. Participants in group one viewed the video with reauditorization first and the video without reauditorization second. Participants in group two viewed the videos in the opposite sequence.

The number of participants was determined by conducting a priori power analysis with a 95% confidence interval and assumed that (a) the performance on each condition would have the same standard deviation of 1.0; and that (b) the mean difference between conditions would be 0.5 or greater. In this case, statistical power was estimated to be 0.8, which was within the acceptable range (Ellis, 2010).

The between subjects factor was the grouping variable and the within subjects factor was the mean score of the dependent variable (e.g., ATNP score, responses to

survey items addressing ease of understanding) for condition one (with reauditorization) versus condition two (without reauditorization). A repeated-measures ANOVA (Type I) was computed to determine that the between subjects factor (i.e., the block or grouping variable) was not significantly different, which confirmed that there was no order effect. Next, the results for the within subjects variable (i.e., mean score of the dependent variable) was used to determine whether the independent variable was associated with significant differences among the dependent variables.

Setting

The research took place in the participants' regular classroom. The classroom held approximately 125 students and had a professionally designed and installed, permanent audio-visual system that was comprised of a Crown XLS 202 amplifier¹, Electro-Voice Sx80 speakers², Audio Technica ATW 3131 microphone³, a Shure SM262 microphone mixer⁴, and Epson 915W projector⁵, that were controlled by a Creston MP2E eight button controller and audio processor⁶. The system also featured a screen permanently positioned at the front of the room so that all participants could see the video.

Materials

Materials used in this study included a test video, two experimental videos (i.e., video one and video two), and the survey instrument. Each will be subsequently described.

Test video. The purpose of the test video was to allow the researcher to play a video that was unrelated to the research topic in the classroom as many times as needed until all participants indicated that they could see the projected video and hear the audio.

The test video was 16 seconds in length and depicted the same scene (a medical setting waiting room) that was used in the experimental videos, except the room had no people in it. While this video was projected, a female voice counted to ten and then instructed any participant to raise her hand if (a) the volume needed adjustment for each participant to adequately hear the recording, or if (b) the participant could not see the projected video. All participants indicated that they could see and hear the video and none required repositioning.

Experimental videos. Similar to the procedures employed by Bedrosian et al. (1998), two experimental videos were developed. Each video displayed an informal conversation between two adult peers whose ages were within the range of the participants' ages. In both videos, the same typically developing 21-year-old white, female actor played the role of Bridget, the communication partner who communicated via natural speech. As documented in previous studies examining attitudes toward AAC (e.g., Achmadi et al., 2015; Beck et al., 2010; Bedrosian et al., 1998; Gorenflo, Gorenflo & Santer, 1994; Hyppa-Martin et al., 2016), a typically developing person also played the role of John, the individual who used AAC. The role of John was played by a 20-year-old white, male actor who was seated in a manual wheelchair. The actor made no other efforts to simulate a disability, although he did not move his legs or right arm, and displayed a generally flat affect characterized by a lack of gestures and facial expressions. The nonelectronic AAC system display was positioned flat on John's wheelchair tray. The display was made of paper and was 8.5 in. high by 11 in. wide and included the letters of the English alphabet, the numbers zero through nine, days of the week, and 82

whole words in a 90-location grid display arranged in alphabetical order, with no picture symbols. Figure 2 depicts the display of the nonelectronic AAC system. The actor playing John implemented a one second self-count between each selection on the AAC system for the purpose of slowing his communication rate to be more typical of a graphic mode AAC user, which was similar to strategies used in other studies' videos (e.g., Bedrosian et al., 1998). A conversational script was followed by the actors and was posted out of the view of the camera for the actors to reference as they enacted the conversation.

[Insert Figure 2 Here]

The recording was made in the waiting room of a healthcare setting, making it seem possible that John and Bridget had come to this setting for an appointment and making their relative position to one another and to the camera (to be described) natural for the environment. The video began with Bridget pushing John in his manual wheelchair into the medical setting waiting room, backing him into a vacant spot, and sitting in the chair to John's right. During the conversation, John was seated in the manual wheelchair facing the camera, so that participants could see his left arm and hand move as he composed his messages using his nonelectronic AAC system. Bridget was also facing the camera. However, Bridget's body was turned slightly to the left (i.e., toward John) so that she could observe the messages that John produced on his nonelectronic AAC system. The camera was positioned 10 feet in front of the dyad, set so that both John's and Bridget's bodies were visible from the thigh to the head within video frame. The camera was positioned to allow a small amount of space visible in the left,

right, and top borders of the video frame to make the waiting room setting obvious to the viewer (refer to Figure 3 for an image of one video frame). Participants could not see the vocabulary on John's nonelectronic AAC system; they could only see that he used an AAC system. This was done to emulate the experience that third party observers might have as they witness the communication exchange between an individual who uses AAC and a communication partner from a natural distance for this context.

[Insert Figure 3 Here]

Each video depicted the same conversation. The conversation implied that Bridget had driven John to a medical appointment, and that the two were engaged in a conversation while they waited for the appointment to begin. John and Bridget conversed about upcoming college-related activities including an exam and homework, and distractions from preparing for those activities, including social media and online videos. In both experimental videos, Bridget used natural speech for all conversational turns and John used the nonelectronic AAC system.

Several attitude studies have utilized separate videos (i.e., one with the independent variable and one without) that were typically filmed on the same day, in the same room, with the same actors (i.e., Achmadi et al., 2015; Beck & Dennis, 1996; Bedrosian et al., 1998; Hyppa-Martin et al., 2016). A similar procedure was initially used for this study, however, despite using scripts and actors, there were slight variations in facial expressions, rate of speech, and intonation patterns between the videos. Consequently, only the video featuring reauditorization was utilized for the present study, and the video without reauditorization was created by removing the reauditorizations that

had been produced by Bridget. This ensured that the conversations were identical between the two experimental videos with the same body positions, facial expressions, intonation patterns, and communication rate. As a result, the only difference between the two videos was the presence or absence of partner reauditorization of the aided AAC message productions. This editing was completed on an Apple MacBook Air⁷ with iMovie⁷ 2011 version 9.0.9.

The editing procedure also allowed other aspects of the videos to be controlled across conditions in a manner similar to those applied in previously published research focusing on attitudes toward persons who use AAC (i.e., Achmadi et al., 2015; Beck & Dennis, 1996; Bedrosian et al., 1998). Specifically, in each video (a) the same conversation took place; (b) the same communication partners were depicted; (c) the same number of communication turns was taken by each partner; (d) the display of the AAC system was identical in size, shape, color, text, and graphics; (e) the position of the AAC system was 5 inches in front of the AAC user; (f) the conversational latency was identical between videos; and (g) the total overall video length was similar and only differed due to the additional time involved for utterances to be reauditorized during the conversation. Specifically, the video that included reauditorization was 19 seconds longer than the video without reauditorization. The decision to use videos that differed in length was made because shortening the longer video would have required removing some of the conversational content from the video. Lengthening the shorter video would have required longer pauses at some point during the video and would have altered the rate and timing of the conversation.

Video one: Conversation with reauditorization. The video used in the reauditorization condition depicted John communicating via the nonelectronic AAC system that produced no voice output. The length of this video was four minutes nine seconds. In this video, Bridget reauditorized John's utterances that he produced using his AAC system. Specifically, John's communication turns were taken as a result of him directly selecting (i.e., touching) the display of the nonelectronic AAC system using his left index finger, immediately followed by the adult conversation partner, Bridget, producing a reauditorization of John's completed message (Lilienfeld & Alant, 2002). Bridget's spoken utterance was an expanded repetition of John's message in a way that (a) may have involved a verb tense change, and (b) was not spoken with rising intonation (Bedrosian et al., 1992; Bedrosian et al., 1998; Hoag & Bedrosian, 1992). Appendix A provides a script of both conversations, as well as the reauditorizations that were produced.

Video two: Conversation without reauditorization. The video for the non-reauditorized condition depicted the same video without the reauditorizations. The length of this video was three minutes 50 seconds. In this video, Bridget did not reauditorize John's aided AAC productions and all other aspects were identical to video one.

Survey Instruments. The *Attitudes Toward Nonspeaking Persons Scale* (ATNP; Gorenflo & Gorenflo, 1991) measured the participants' attitudes toward the individual who used AAC. A survey containing 12 original survey questions was created for the study to query participants regarding (a) ease of understanding John; (b) willingness to engage in interactions with John; and (c) preferences regarding the AAC systems.

Additionally, twelve demographic survey questions were included to obtain information about the participants. Finally, responses to two open-ended survey questions were elicited to examine participants' perspectives regarding the differences between the videos. Each instrument will be described subsequently.

Demographic survey questions. Twelve survey items (Appendix B) were designed to elicit demographic information about respondent gender, age, academic major, experience with individuals with disabilities, and familiarity with AAC.

Attitudes Toward Nonspeaking Persons scale. A discussion of the development and validation of the ATNP was provided in the article by Gorenflo and Gorenflo (1991) and a copy of the instrument is displayed in Appendix C. The ATNP was created for implementation with adult respondents and has been used to measure undergraduate and graduate students' attitudes toward adults who use AAC (Gorenflo & Gorenflo, 1991, 1994, 1997; McCarthy et al., 2010; Raney & Silverman, 1992). The ATNP is a 29-item survey instrument that elicits a response to both positively and negatively worded questions using a five-point rating scale. In terms of reliability, the ATNP's internal consistency was 0.9 (Gorenflo & Gorenflo, 1991; McCarthy & Light, 2015); 0.7 and higher is considered acceptable (Haynes & Johnson, 2009; Hyde, 2000). To examine validity of the instrument, results from the ATNP were correlated with those from a similar questionnaire (i.e., the *Attitudes Toward Disabled Persons*, Yunker, Block, & Young, 1966). The results of $r = .33, p < .01$ supported the validity of the ATNP as a measure of the attitudes toward an individual who does not speak.

The ATNP is reported to measure two aspects of attitudes (Gorenflo & Gorenflo, 1991) including: (a) a general evaluative dimension (e.g., “This person should expect to live a normal life” and “This person is not intelligent”); and (b) an interactive/affective dimension (e.g., “I would feel uncomfortable with this person” and “This person would be easy to talk to”). The general evaluative subscale has been described as consisting of 19 items, ten of which are positively worded and nine of which are negatively worded, and the affective/interactive subscale has been described as being 10 items, five of which are positively worded and five of which are negatively worded (Gorenflo & Gorenflo, 1991). With respect to subscales on the instrument, to date, no published study has specified exactly which of the 29 survey items comprise each subscale. No disclosure of this information was made in Gorenflo (1986) in which the ATNP was developed; and it was not available from the author who most recently reported on the ATNP and its subscales (J. McCarthy, personal communication, March 27, 2016). A factor analysis examining the variance within the dataset of responses to the 29 ATNP items from the present study did not support the presence of two principle components (i.e., subscales) for the current study, so separate analyses by subscale were not conducted and only overall mean ATNP scores were used to examine the effect of the independent variable on attitude.

Twelve original survey questions examining ease of understanding, willingness to interact, and preference. In addition to the questions on the ATNP, responses to 12 original survey questions (OSQs) designed to examine ease of understanding and willingness to interact with the AAC user, as well as preferences regarding AAC systems,

were elicited on separate survey pages that accompanied the ATNP (refer to Appendices D). Similar to the ATNP questions, these OSQ items used a 5-point scale. These survey items were similar to those used in previous studies examining undergraduates' perspectives about AAC (Achmadi, et al., 2015) and were selected to obtain information regarding three additional aspects of reauditorization that included: (a) perceived ease of understanding the messages generated using each AAC system (e.g., *In this video, I could understand all of John's messages as easily as I understand a message produced by a typical speaking person*); (b) willingness to interact with the person using AAC (e.g., *I would really like to interact in a conversation with John*); (c) preference of AAC system for use by self (e.g., *If I had to use an AAC system for the rest of my life, I would prefer to communicate using a method exactly like the one that John and Bridget used in this video*), and preference of AAC system for use by a person with whom the respondent spends "a lot of time" (i.e. *If a person that I spend a lot of time with needed to use an AAC system for the rest of his/her life, I would prefer for that person to communicate using a method exactly like the one that John and Bridget used in this video*).

Two open-ended survey questions regarding participants' perspectives about the differences between experimental videos. Two open-ended survey items (Appendix E) were included to examine participants' perspectives about the differences between the two experimental videos. Specifically, the items explored whether participants noticed a difference between the videos, as well as their perceived impact that any perceived difference had on the conversation.

Procedure

The entire procedure involving the participants providing consent, viewing all videos, and completing the surveys, took an average of 28.5 minutes and was administered by one researcher and one assistant. The study was briefly introduced and consent was obtained.

One block of participants (n=32) viewed experimental video one then two. A second block of participants (n=32) viewed the videos in the opposite sequence. For all participants, each condition was administered in the same classroom on the same day. First, participants were randomly divided into two groups. Group one remained in the classroom, while group two participated in a class assignment activity unrelated to the study. This class assignment activity took place in an area where participants were unable to see or hear the study's activities in the classroom.

The test video was played. ATNP administration protocols (Gorenflo & Gorenflo, 1991) were followed. Pencils were distributed and paper surveys were placed face-down on each participant's desk. Participants were told that they could ask questions at any time (although no questions were asked by any participants during any of the sessions).

Next, experimental video one was played. After viewing this video, participants completed the ATNP (Appendix C) plus the 12 original survey questions (Appendix D) that examined reported ease of understanding the peer who used AAC, willingness to interact with the peer who used AAC, and preference for AAC system. Next, respondents completed the twelve demographic questions on the survey (Appendix B). Experimental video two was then played and the process was repeated using the identical procedures, except that (a) the two open ended survey items (Appendix E) were also presented

following this second video, and (b) the twelve demographic questions (Appendix B) were not presented following the second video because this information only needed to be collected one time. All participants remained seated until all participants had completed and submitted the survey. When participants had completed all survey questions, pencils and surveys were submitted to the researcher or research assistant.

After group one completed participation, they were assigned to the alternative class activity (previously described), while group two participants returned to the classroom. Participants did not have an opportunity to talk with one another while passing between the classroom and outside activity location because one group exited through classroom doors on the opposite end of the room from those who were entering. When group two participants were seated in the classroom, the exact same procedures that had been used with group one were followed, with the exception that the sequence of the experimental videos was opposite that presented to group one.

Procedural Fidelity and Inter-observer Agreement

Procedural fidelity (Appendix F) was recorded during administration of the survey to ensure the same procedures were applied across the all data collection. A procedural checklist was created and consisted of 72 individual steps. The researcher and research assistant reviewed survey administration procedures during a practice session. The research assistant took procedural fidelity and was present for the entirety of each data collection. The same procedures were followed across each administration of the survey. Among both experimental conditions (2 groups) procedural fidelity was recorded for 100 percent of each experimental session across participants and conditions.

Procedural fidelity was computed as agreements, divided by agreements plus disagreements, multiplied by 100. Results were $72 / 72 + 0 \times 100 = 100\%$ indicating that procedural fidelity was 100% for both conditions for all survey administrations.

Participants' survey responses were entered into Excel[®]. To ensure consistency in data entry, two independent researchers examined ten percent of all survey entries to compute inter-observer scoring agreement using the formula: Agreements, divided by agreements plus disagreements, multiplied by 100. Results were $424 / 424 + 0 \times 100 = 100\%$ in reauditorization condition and $424 / 424 + 0 \times 100 = 100\%$ in the no reauditorization condition, indicating that accuracy of data entry was 100% for both conditions.

Chapter Four: Results

The term “block” refers to the between subjects grouping variable related to the sequence in which participants viewed the two experimental videos. “Condition” refers to the presence or absence of the partner reauditorization strategy. “Score” refers to the average response to survey items, on a scale of 1 to 5.

Reliability and Validity of the ATNP Scale

Although it was not a primary focus of this study, the reliability of the ATNP was examined. Cronbach’s alpha coefficient for the ATNP scale was 0.82, indicating an acceptable level of reliability (Zimmerman, Zumbo, & Lalonde, 1993).

Research Question One: Effect of Reauditorization on Attitudes Toward the Individual Who Used AAC

Distributions of overall ATNP scores for both blocks of participants were analyzed to ensure that the assumptions for the subsequent statistical tests were met including verifying: (a) a normal distribution, which is generally evident according to the histogram and density plots (Figure 4) and was also evident in an examination of QQ plots, although the analyses used (described subsequently) were robust to this issue for the present sample size; (b) equal variance, which was examined with an F -test that was not significant, $F(63,63) = 1.17, p = 0.55$; and (c) independent sampling, which was ensured by the experimental procedure.

[Insert Figure 4 Here]

Examining order effect. A block effect (i.e., order effect) on overall ATNP score was not detected using repeated-measures ANOVA (Type I; $F(1,62) = 0.0009, p = 0.98$).

Side-by-side box plots (Figure 5) display similar mean ATNP scores from participants for both conditions, regardless of block. Scores for participants in the RN block (i.e., group one) for the reauditorization condition were higher ($M = 3.85$, $SD = 0.42$, $Range = 2.83-4.55$) than for no reauditorization ($M = 3.67$, $SD = 0.46$, $Range = 2.69-4.52$). Similarly, within the NR block (i.e., group two), reauditorization scores ($M = 3.83$, $SD = 0.44$, $Range = 2.55-4.59$) were also generally higher than scores for the no reauditorization condition ($M = 3.69$, $SD = 0.47$, $Range = 2.76-4.66$).

[Insert Figure 5 Here]

Effect of reauditorization on overall ATNP score. Participant ratings on the ATNP were significantly higher for the reauditorization condition. Sixty-four paired samples of mean ATNP ratings by experimental condition were analyzed using a paired t -test. Results indicated a significantly higher mean score for reauditorization ($M = 3.84$, $SD = 0.43$, $Range = 2.55-4.59$) than for no reauditorization ($M = 3.68$, $SD = 0.46$, $Range = 2.69-4.66$) ($t(63) = 5.66$, $p < 0.001$). *Cohen's d* was 0.71, suggesting a medium to large effect size of reauditorization on mean ATNP score.

Effect of reauditorization on each individual ATNP item. Item level analyses revealed no significant differences for any of the 29 ATNP items between experimental conditions (i.e., reauditorization and no reauditorization). Figure 6 displays mean score differences for each of the individual ATNP items by experimental condition. Separate paired t -tests were conducted for all 29 ATNP items. To control type I family-wise error during the application of the simultaneous t -tests, a Holm-Bonferroni correction (Holm,

1979) was applied. The ordered p -values, adjusted according to the correction (Range = 0.06-1.00), are displayed in Figure 7.

[Insert Figure 6 Here]

[Insert Figure 7 Here]

Participant characteristics and overall ATNP score. Three participant characteristics were associated with statistically significant differences in overall ATNP ratings, including: (a) experience working in a paid position with persons with disabilities, (b) experience interacting with persons with disabilities, and (c) majoring in communication sciences and disorders.

Working in a paid position with persons with disabilities. Participants who had worked in a paid position with persons with disabilities for more than 160 hours had similar overall ATNP scores ($M = 3.78$, $SD = 0.33$, $Range = 3.10-4.48$) compared to those participants who reported no time working with individuals with disabilities ($M = 3.73$, $SD = 0.46$, $Range = 2.69-4.66$). However, after accounting for all other demographic variables using Type II ANOVA, time spent working in a paid position with persons with disabilities was a significant predictor of ATNP score ($F(3,100) = 3.88$, $p = 0.01$). Participants who had worked more than 160 hours with individuals with disabilities had significantly lower ATNP scores (i.e., reported generally less positive attitudes) than participants who had not worked with individuals with disabilities ($\beta = -0.39$, $SE = 0.13$; $t(100) = 3.08$, $p = 0.003$). Eta squared for the variable of having worked in a paid position was 0.06, suggesting a very small effect size.

Experience interacting with persons with disabilities. Mean ATNP ratings were generally higher (i.e., attitudes were more positive) as participants' time spent interacting with persons with disabilities increased. Specifically, participants who had never interacted with individuals with disabilities had lower ratings, indicating less positive attitudes, ($M = 3.31$, $SD = 0.64$, $Range = 2.69- 3.89$) than participants who interacted with persons with disabilities for one to 40 hours ($M = 3.59$, $SD = 0.44$, $Range = 2.55-4.55$), 41 to 160 hours ($M = 3.75$, $SD = 0.38$, $Range = 2.89-4.24$), or more than 160 hours ($M = 3.93$, $SD = 0.41$, $Range = 3.10-4.66$). After accounting for all other demographic variables, the overall effect of interacting with individuals with disabilities was significant ($F(3,100) = 13.14$, $p < 0.001$). Eta squared was 0.19 suggesting a small effect size of this variable.

Majoring in communication sciences and disorders. Finally, the group of participants who reported a major of communication sciences and disorders (CSD) had higher ATNP ratings ($M = 3.86$, $SD = 0.37$, $Range = 3.17-4.66$), suggesting more positive attitudes, than those who reported non-CSD majors ($M = 3.70$, $SD = 0.48$, $Range = 2.55-4.55$) and this predictor was significant after accounting for all other demographic variables ($F(1,100) = 9.72$, $p = 0.003$). Eta squared was 2.76e-16 suggesting virtually no effect size for this variable.

Research question two: Effect of reauditorization on reported ease of understanding the individual who used AAC. Participants reported that the AAC user was easier to understand when reauditorization was implemented. A Type I ANOVA that accounted for variation among participants through random effects indicated a significant

effect for condition ($F(1, 63) = 127.60, p < 0.0001$), but not for block ($F(1, 62) = 3.94, p = 0.0515$). Box plots of overall mean scores on the 12 original survey questions (OSQ) showed generally less positive (lower) scores during the no reauditorization condition (refer to Figure 8). Scores for this specific variable (i.e., reported ease of understanding) were based on responses to three items from the set of 12 original survey questions (OSQ) that participants answered in addition to the 29 ATNP items. These OSQ items are displayed in Appendix D. The three items that examined reported ease of understanding included: (a) OSQ item 1, “In this video, I could understand all of John’s messages as easily as I understand a message spoken by a typical speaking person;” (b) OSQ item 11, “It was really easy for me to understand John’s communication;” and (c) OSQ item 12, “I understood everything that John communicated to Bridget in this video.” A paired t-test indicated a significant difference between ratings for the reauditorization condition ($M = 3.60, SD = 1.01, Range = [1.00, 5.00]$) versus the no reauditorization condition ($M = 2.08, SD = 0.87, Range = [1.00, 4.33]$) ($t(63) = 11.30, p < 0.0001$). A large effect size for condition, $d = 1.41$, was detected.

[Insert Figure 8 Here]

Research question three: Effect of reauditorization on reported willingness to interact with the individual who used AAC. Responses to two OSQ items shown in Appendix D (i.e., OSQ item 5: “I really think that John would fit in well with my circle of friends,” and OSQ item 6: “I would really like to interact in conversations with John”) were analyzed to determine whether participants’ reported willingness to socially interact with the AAC user varied as a function of block or condition. Participants reported a

significant decrease in willingness to interact with the AAC user when reauditorization was not used. A Type I ANOVA that accounted for variation among participants through random effects indicated a significant effect for condition ($F(1, 63) = 9.95, p = 0.003$), but not for block ($F(1, 62) = 1.02, p = 0.32$). Scores for reauditorization ($M = 3.48, SD = 0.75, Range = [1.50, 5.00]$) were higher than for no reauditorization ($M = 3.29, SD = 0.75, Range = [2.00, 5.00]$). This outcome resulted in a statistically significant difference between the conditions ($t(63) = -3.15, p = 0.003$). The effect size for condition was $d = 0.39$, indicating a small effect for reauditorization.

Research question four: Effect of AAC system on preference for self-use.

Responses to OSQ item 2 in Appendix D (i.e., “If I had to use an AAC system for the rest of my life, I would prefer to communicate using a method exactly like the one that John and Bridget used in this video”) were examined to determine whether preference for self-use of an AAC system varied as a function of block or condition. A Type I ANOVA that accounted for variation among participants through random effects indicated that neither block ($F(1, 62) = 0.12, p = 0.73$), nor condition ($F(1, 63) = 3.82, p = 0.06$), were significant predictors for preference of AAC system for self-use. The reauditorization condition resulted in a higher mean rating ($M = 2.63, SD = 0.90, Range = [1.00, 5.00]$) compared to the no reauditorization condition ($M = 2.38, SD = 0.85, Range = [1.00, 5.00]$). However, this outcome did not result in a significant difference between the two conditions ($t(63) = -1.95, p = 0.06$).

Research question five: Effect of AAC system on preference for use by

others. Participants’ responses to OSQ item 3 from Appendix D (i.e., “If a person that I

spend a lot of time with needed to use an AAC system for the rest of his/her life, I would prefer for that person to communicate using a method exactly like the one that John and Bridget used in this video”) were examined to determine if preference for use by others varied as a function of condition or block. A Type I ANOVA that accounted for unexplained variation in scores among participants through random effects showed that neither condition ($F(1, 63) = 1.33, p = 0.25$), nor block ($F(1, 62) = 0.19, p = 0.66$), predicted preference for use of an AAC system by others with whom the participants “spend a lot of time.” The reauditorization condition again resulted in a higher mean rating ($M = 2.70, SD = 0.83, Range = [1.00, 4.00]$) when compared to the no reauditorization condition ($M = 2.56, SD = 0.77, Range = [1.00, 5.00]$). However, this outcome did not result in a statistically significant difference between the two conditions ($t(63) = -1.16, p = 0.25$).

Effect of reauditorization on each individual OSQ item. Responses to each individual OSQ item were examined to determine whether reauditorization had an effect on responses to any of these 12 items. An item-level analysis employed paired t -tests to compare responses between conditions. To control type I family-wise error during the application of the simultaneous t -tests, a Holm-Bonferroni correction (Holm, 1979) was applied. This analysis provided evidence to reject the null hypothesis that there is no difference associated with reauditorization at the item level for four OSQ items (refer to Figure 9), revealing p -values that were small enough to be considered significant at the $\alpha = 0.05$ level, and effect sizes considered to be large to very large, as follows:

- (a) Item 1 (i.e., “In this video, I could understand all of John’s messages as easily as I understand a message spoken by a typical speaking person”) (M of difference (NR – R) = -1.41, SD of difference (NR – R) = 1.20, $Range$ of difference (NR – R) = -4 – 1) ($t(62) = -9.34, p < 0.001$), Cohen’s $d=1.18$;
- (b) Item 4 (i.e., “I did not understand about half of the conversation that John and Bridget had in this video”) (M of difference (NR – R) = -1.63, SD of difference (NR – R) = 1.47, $Range$ of difference (NR – R) = -4 – 4) ($t(63) = -8.81, p < 0.001$), Cohen’s $d=1.11$;
- (c) Item 11 (i.e., “It was really easy for me to understand John’s communication”) (M of difference (NR – R) = -1.38, SD of difference (NR – R) = 1.16, $Range$ of difference (NR – R) = -4 – 1) ($t(63) = -9.47, p < 0.001$), Cohen’s $d=1.18$;
- (d) Item 12 (i.e., “I understood everything that John communicated to Bridget in this video”) (M of difference (NR – R) = -1.77, SD of difference (NR – R) = 1.31, $Range$ of difference (NR – R) = -4 – 2) ($t(63) = -10.81, p < 0.001$), Cohen’s $d=1.35$.

This analysis did not provide evidence to reject the null hypothesis of no difference for reauditorization for the remaining nine OSQ items. Differences between mean scores for each individual OSQ item in the reauditorization versus no reauditorization condition ranged from -0.03 to 1.77. Figure 10 provides a visual analysis. Item 9, which queried preference for an electronic, computerized, touch screen AAC system with voice output, had an identical mean score for both conditions, and the other 11 OSQ items had some difference in mean scores between conditions. In general, the items related to reported

ease of understanding tended to have larger differences between the reauditorization and no reauditorization conditions.

[Insert Figure 9 Here]

[Insert Figure 10 Here]

Preference for electronic AAC systems. OSQ item nine elicited responses about whether participants would prefer to use an electronic communication aid featuring synthesized speech output as opposed to the nonelectronic systems in the videos. This item did not yield statistically significant difference at an item level, suggesting that the presence or absence of reauditorization did not affect the responses to this item. However, separate one-sample *t*-tests comparing the sample mean to the null hypothesis of mean=3.0 (i.e., the “undecided” rating on the survey), indicated that the mean participant rating was significantly higher than 3.0 in both the reauditorization condition ($M= 3.84$, $SD=0.65$, $Range= 3.0-5.0$), $t(63) = 10.42$, $p\text{-value} < 0.0001$, Cohen’s $d=1.30$), as well as the no reauditorization condition ($M=3.84$, $SD=0.80$, $Range=1.0-5.0$, $t(63) = 8.43$, $p\text{-value} < 0.0001$, Cohen’s $d=1.05$). Hence, an electronic AAC system with synthesized speech output was preferred for self-use more than a nonelectric AAC system during both experimental conditions.

Perceived Differences Between Experimental Videos

Responses to the two open-ended survey items shown in Appendix D were analyzed to determine (a) whether participants recognized that reauditorization was implemented in one video, but not the other, and (b) the perceived impact of this difference between the two videos.

Participants had not been given information about reauditorization, nor about any differences between the videos. However, responses to the first open-ended survey item indicated that 63 of the 64 participants were aware of the difference between conditions. The item directed participants to “briefly state what Bridget did differently when communicating with John in video one versus video two.” Responses included three general themes: One participant indicated that she did not detect a difference; three participants indicated some aspect of interaction was better in one video than the other (e.g., improved eye contact, more interaction, more involved); and the remaining 60 participants (94%) specifically described reauditorization, suggesting that they recognized the difference in Bridget’s communication behavior in that she “spoke” John’s messages, “repeated what John wanted to say,” or the like.

The second open-ended survey item, “In your opinion, what impact did this difference have?” elicited narrative responses from 61 participants (95%) that related to ease of understanding including, “Listeners could hear both sides of the conversation,” or “I could understand John.” One participant indicated that there was no impact, one did not know, and one participant did not respond to this item.

Chapter Five: Discussion

This study examined whether the attitudes reported by undergraduate college students about a peer who used a nonelectronic AAC system varied as a function of the presence or absence of partner reauditorization. It also examined the effect of reauditorization on reported ease of understanding and willingness to interact with the AAC user, as well as preferences for AAC system.

Attitudes Were More Positive in the Presence of Reauditorization

Results support the hypothesis that attitudes were more positive in the presence of partner reauditorization than in the absence of partner reauditorization and indicated a medium to large effect size ($d = 0.71$) of this variable. This finding is in contrast to those obtained in four previous studies (i.e., Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992). These previous investigations reported no change in respondents' attitudes toward a person using AAC in the presence or absence of reauditorization. However, one difference between the present study and the previous studies relates to the survey instrument that was used. The previous studies employed a survey instrument that included judgments about the communicative competence of the AAC user, whereas the survey used in the present study was designed to focus solely on behaviors, thoughts, and feelings about the AAC user. It is possible that reauditorization does not have an effect on communicative competence judgments, but does have an effect on other components of attitudes toward an AAC user, which could explain the different findings.

Another possible explanation for the difference between the present findings and

those of the four previous examinations could be related to the AAC system that was used in study procedures. Each of the previous studies compared reauditorization of a speech-generating device (SGD) to no reauditorization of an SGD, which may have equated the conditions in terms of the auditory information that reached participants. The present study compared reauditorization of a nonelectronic AAC system to no reauditorization of the system. In this circumstance, reauditorization provides voice output for an AAC system that would not otherwise have voice output and more positive attitudes have been noted in the presence of voice output versus in the absence of voice output (Achmadi et al., 2015; Lilienfeld and Alant, 2002). Similarly, more positive attitudes have been detected when the respondent has more information about the AAC user (e.g., Gorenflo & Gorenflo, 1991; McCarthy et al., 2010) and perceives him/herself as being more similar to the AAC user (Gorenflo & Gorenflo, 1997). For example, in this study, John's reauditorized utterances included information about upcoming college-related activities including an exam and homework, and distractions from preparing for those activities, including social media and videos. Given that the participants in this study were also college students, some of the information in John's reauditorized utterances may have increased the respondents' perceived similarity with John, while also increasing the amount of information they had about him, and this might have contributed to the improvement in attitudes about John in the presence of reauditorization. Each of the four previous studies on reauditorization (i.e., Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992) employed the same AAC user as a referent. Therefore, even though reauditorization was systematically explored as an

independent variable in four previous empirical investigations, only one individual AAC user served as the object of the attitudes in these four previous reauditorization studies (i.e., Bedrosian, et al., 1992; Bedrosian et al., 1998; Hoag et al., 1994; Hoag & Bedrosian, 1992) prior to the present study. In fact, the same video recording, featuring the same adult male actor, following the same script, was used in each of the four earlier investigations. Consequently, it is possible that individual differences between the AAC users, the scripted conversations, and/or the conversation topics, could have contributed to the different findings between this study and the previous studies. It is also possible that each of the preceding aspects of reauditorization may have contributed to its positive effect on the attitudes that peers reported about John, the AAC user in the current study.

The Aided Message was Easier to Understand in the Presence of Reauditorization

As hypothesized, reauditorization was associated with an easier understanding John's aided message. A large effect size ($d = 1.41$) was indicated for the ease of understanding variable. These findings support previous studies' outcomes in which more positive attitudes were associated with greater ease of understanding the aided message (Achmadi, et al., 2015; Richter et al., 2003). An inherent limitation of nonelectronic, graphic mode AAC systems is that a communication partner must have a direct line of sight to the AAC system in order comprehend the AAC user's message (Johnston et al., 2012; Reichle & Sigafos, 1991). In the present study, John's AAC system display was not directly visible to participants. The video camera was placed at a distance that permitted the viewer to see and hear John and Bridget communicating, but prevented the viewer from seeing the contents of John's AAC system display. This emulated the natural

distance and experience that a bystander might encounter while observing an individual using a nonelectronic AAC system in natural, social setting. Given that the participant had to guess the content of each of John's utterances in the absence of reauditorization, it is not surprising that reported ease of understanding was greater during the reauditorization condition.

It is somewhat surprising, however, that there was no order effect (i.e., block effect). That is, reauditorization had a significant positive effect on reported ease of understanding even for the participants who viewed the reauditorized conversation before the conversation without reauditorization. The conversations were identical in each video, with the exception of the partner reauditorization. As such, participants in the RN group (i.e., group two) knew the content of the John's utterances before they viewed the video without reauditorization, but these participants still tended to rate ease of understanding lower in the second condition (i.e. the absence of reauditorization). Notably, even though the conversations were identical (except for the presence or absence of reauditorization) participants were not privy to this information. It is possible that the reduced ease of understanding was related to extra effort spent trying to determine whether the conversation was, in fact, on the same topic, or confusion as to why Bridget had discontinued the reauditorization strategy.

Willingness to Interact with the AAC User was Greater in the Presence of Reauditorization

Participants reported greater willingness to engage in a social interaction with the AAC user during the reauditorization condition as opposed to when reauditorization was

not employed. The effect size was small for this variable ($d = 0.39$). Attitudes have been reported to be more positive in the presence of voice output when compared to the absence of voice output (Achmadi et al., 2015; Lilienfeld and Alant, 2002).

Consequently, it was not surprising that undergraduate college students' willingness to engage in a social interaction with the AAC user was greater in the presence of partner reauditorization than in the absence of partner reauditorization.

More research is needed on the role of reauditorization and willingness to socially interact with a person who uses nonelectronic AAC for a many reasons. First, the present study showed that reauditorization was associated with increased willingness to socially interact with John. This is noteworthy given the need to improve social experiences for AAC users (Batorowicz et al., 2014; Beukelman & Mirenda, 2013; Blackstone & Hunt-Berg, 2003; Calculator & Black, 2009; McCarthy & Light, 2005). However, this study did not examine why this was the case and additional inquiry into this relationship should be conducted.

Second, the present survey had only two survey items that examined the issue of willingness to interact with the AAC user (i.e., OSQ item 5: "I really think that John would fit in well with my circle of friends," and OSQ item 6: "I would really like to interact in conversations with John"). A more comprehensive exploration of willingness to socially interact with an individual can, and should, be measured by probing more than whether an AAC user would fit in a social circle and whether a conversation would be enjoyable. It should probe other aspects of typical social interactions such willingness to invite the individual to one's home and willingness to attend a social function together.

Third, it is possible that reauditorization may have a greater effect on willingness to interact if the participant is told about expectations for reauditorizing. Participants in the study had no or limited training on AAC (i.e., none had received more than 5 hours of training about AAC) and were likely naïve to how the nonelectronic AAC system really worked. It is possible that some participants may have anticipated that interacting with John might require them to reauditorize John's messages. If the participant felt unsure or uneasy about this, which is likely given their lack of training on AAC, the participant may have rated willingness to interact lower. Future studies should delineate whether willingness to interact with an AAC user increases in the presence of a care partner who reauditorizes the messages, as opposed to the naïve participants being expected to provide the reauditorization.

Electronic AAC Systems Were Preferred Over Nonelectronic AAC Systems

Participants were asked about their preferences for the nonelectronic paper based communication board with reauditorization versus without reauditorization for their own use, and for use by a person with whom they spend a lot of time. Although preference ratings for reauditorization were higher (i.e., more preferred) for both self-use and use by others, this outcome did not result in a statistically significant difference in either case.

When it comes to preferences for others' use of an AAC system, participants' attitudes might, once again, be influenced by confusion about who must do the reauditorizing. For example, it is possible that participants might have preferred the nonelectronic system with reauditorization for a peer, as long as reauditorizations were to be produced by somebody other than the respondent. This relationship warrants further

exploration.

It was hypothesized that undergraduate college students' would report a preference for partner reauditorization for use by self and others based on outcomes reported in previous research in which a majority of participants indicated a preference for systems with voice output (Achmadi et al., 2015; Hyppa-Martin et al., 2016). Findings did not support this hypothesis. Notably, the two previous studies (Achmadi et al., 2015; Hyppa-Martin et al., 2016) compared preferences for no voice output versus SGD output, and did not examine preferences for voice output via reauditorization. In the present study, one survey item (i.e., OSQ item nine) was designed to elicit responses about whether participants preferred electronic AAC systems with synthesized voice output versus the nonelectronic systems featured in this study's experimental videos.

Item-level analysis suggested that preference for an electronic AAC system did not vary as a function of the presence or absence of reauditorization, so an additional analysis was conducted to compare the responses to this item to the neutral response (i.e., 3.0 on the five point rating scale). A statistically significant difference suggested that participants preferred the electronic AAC system with synthesized voice output over the nonelectronic AAC system, regardless of the reauditorization condition, and revealed a large effect size for this variable ($d=1.05$). Consequently, the present study supports the findings of Achmadi et al. (2015) and Hyppa-Martin et al. (2016) in that participants reported a preference for self-use of an SGD rather than a nonelectronic AAC system. Preference for use of an SGD by others was not examined in the current study. Examining this variable, as well as its potential effect on increasing the likelihood of

social interaction with peers, would be worthwhile.

Participant Characteristics Associated with More Positive Attitudes Toward AAC Users

Three participant characteristics of those obtained from the twelve-item demographic survey (Appendix B) were associated with significant differences in attitudes toward the AAC user.

Effect on attitude toward AAC user: Experience working in a paid position with persons with disabilities. Although the variable had a small effect size (eta squared was 0.06), participants who had experience working in a paid position with persons with disabilities for more than 160 hours (n= 9) reported significantly less positive attitudes than participants who had never worked with this population (n=37). This finding should be interpreted with caution because of the small sample of individuals who had more than 160 hours of work experience. However, this outcome is similar to other studies in which persons who had more experience working with individuals with disabilities generally rated an AAC user less positively than naïve participants who had never worked with this population (Bedrosian et al., 1992; Hoag et al., 1994). Bedrosian et al. (1992) suggested some possible reasons for this result: (a) the participants who had never worked with this population might be impressed that a person with physical limitations (e.g., John used a wheelchair and moved one arm) could communicate at all; (b) experienced participants may consider their responses from the first-hand viewpoint of an interactant, whereas inexperienced participants may only consider their responses as a third-party observer of the interaction; and (c) participants who have worked with individuals with disabilities

may have developed a more critical perspective about the characteristics and skills needed to be a successful communicator in spite of the disability. Together, these factors might be related to the more positive attitudes that were reported among participants with no experience working in a paid position with persons with disabilities.

Effect on attitude toward AAC user: Experience interacting with persons with disabilities. By contrast, participants in the present study who had more experience interacting with persons with disabilities tended to have more positive attitudes toward the AAC user. Similar findings have been reported in other studies (e.g., Beck & Dennis, 1996; Beck, Kingsbury et al., 2000) in which children who had more opportunity to interact with individuals with disabilities reported more positive attitudes toward AAC users. However, the findings from the present study should be interpreted cautiously because less than 10% (n=8) of participants reported interacting with persons with disabilities for more than 41 hours. Future studies could explore the relationship between experience interacting with persons with disabilities and attitudes toward them, as well as the types and length of interactions that may be associated with improved attitudes and behaviors exhibited toward the AAC user by potential communication partners.

Effect on attitude toward AAC user: An academic major in communication sciences and disorders. Twenty-four (24) of the 64 participants reported communication sciences and disorders (CSD) as their academic major. This major was associated with a significantly more positive attitude toward the AAC user when compared to non-CSD majors. However, the effect size was very small (eta squared was 2.76e-16). Better understanding such characteristics of potential communication partners, and the role they

play in attitudes toward AAC users, might inform partner training and could help foster more positive social experiences for AAC users.

Participants Reported That Reauditorization Had a Positive Impact on Conversation

Participants were not given any information about reauditorization, nor about the differences between the experimental videos they viewed. Two open-ended survey items were designed to elicit information about whether or not participants noticed the difference between the videos and, if they did, what their perspectives were about the effect of reauditorization on the conversation they had observed. Most participants indicated awareness of the partner reauditorizations by stating that Bridget “spoke” or “repeated” John’s messages in one video, but not in the other video. Specifically, 94% of participants (60/64) noted that reauditorization was implemented in one video and absent in the other, and (b) 95% of participants (61/64) perceived that reauditorization had a positive impact on the conversation, often noting increased ease of understanding John during the reauditorization condition. For example, participants stated the following about the video with reauditorization:

- *It showed me that John was in college and has a social life. It made me look at John a lot differently.*
- *It had a big impact. It was much easier to understand them.*
- *I realized this was an effective way of communicating.*
- *Makes their conversation go faster and more smooth.*
- *I feel like it made John feel more important and cared about.*

- *I feel John was a lot more comfortable with his communication.*

Examples of comments about the video without reauditorization included the following:

- *It made me feel like I wouldn't be able to relate or communicate with John.*
- *It was kind of an awkward conversation to witness.*
- *It seemed like a one-sided conversation and kind of ignores the fact that he's there.*
- *It made it more difficult to understand the conversation between Bridget and John.*
- *Made it harder for others to participate in conversation with them.*
- *For their conversation, it still went the same. However, as a third person I did not know the context of what Bridget's responses were because I don't know what John said.*

Responses to the open-ended survey items also indicated that this relatively naïve group of participants recognized reauditorization with no advance prompting, and acknowledged potential benefits of the strategy. Notably, no responses indicated any negative perspectives about reauditorization. A majority of the responses mentioned increased ease of understanding the conversation in the reauditorization condition which was consistent with the findings regarding ease of understanding on the scaled response survey items (i.e., OSQ items 1, 11, and 12).

Limitations

Several aspects of this study limit the generalization and meaningfulness of its findings. John and Bridget followed a script, which would not be the case if a third party was observing such a communication exchange in a natural context. This study only evaluated the attitudes of females. Historically, females have been shown to have more

positive attitudes toward persons with disabilities when compared with males (Beck & Dennis; 1996; Beck et al., 2001; Beck et al., 2010; Beck, Kingsbury et al., 2000; Blockberger et al., 1993; Dada & Alant, 2002). Outcomes of the current study may have been different had male respondents served as participants. Similarly, this study only evaluated the effect of reauditorization on the attitudes held by undergraduate college students. Results might be different for younger or older participants. Additionally, this study only examined attitudes toward a single, unfamiliar, male AAC user. The findings may vary if attitudes toward groups of AAC users, female AAC users, or familiar AAC users had been examined.

It is also important to note that the present study examined reported attitudes toward an AAC user, rather than actual behaviors directed toward the AAC user. Attitudes have been documented to predispose people to a corresponding class of actions (Eagly & Chaiken, 2007; Kraus, 1995; McCarthy & Light, 2005; Triandis, 1971) and relate in a predictable way to the attitude holder's social behavior (McCarthy & Light, 2005; McCarthy et al., 2010). However, it is possible that reported attitudes may not consistently inform the behaviors that participants may have directed toward John, had they been observed in an actual interaction with John.

Future Research Directions

McCarthy and Light (2005) identified three categories of research into attitudes toward AAC users. These included (a) how participant characteristics influenced reported attitudes; (b) how characteristics of the AAC user influenced reported attitudes; and (c) how the characteristics of the AAC system influenced reported attitudes. This study

contributes a potential fourth category: how behaviors of the communication partner influence reported attitudes. Specifically, findings indicated that reauditorization by a communication partner resulted in more positive attitudes being reported by female undergraduate students toward a peer who used a nonelectronic AAC system.

Reauditorization was also associated with improved reported ease of understanding and willingness to interact with the AAC user. Future research should continue to explore how behaviors of the communication partner may influence the attitudes that the general public holds toward AAC users.

Preferences about AAC systems also require further study. Responses to open-ended survey items indicated that participants recognized many perceived benefits of reauditorization but, despite this general positive regard for reauditorization, a preference for using reauditorization was not detected. In fact, participants generally preferred an SGD, should they need to use an AAC system. Richter et al. (2003) highlighted that successful communication should be considered from the perspectives of both the message sender and the receiver, and that the capabilities, attitudes, and preferences of both the AAC user and the intended recipients of the aided messages should be considered when selecting, designing, or developing AAC systems. Future research should continue to explore the preferences of AAC users and their communication partners in order to help people select AAC systems that will best support both successful communication interactions and social engagement (Richter, et al., 2003; McCarthy & Light, 2005).

Future research should also consider the efficiency of strategies to improve

attitudes toward AAC users, offering maximum improvement in attitudes without requiring substantial effort for the AAC user or communication partner. Individuals with visible disabilities, such as aided AAC users, have reported experiencing negative attitudes and behaviors directed toward them and are at risk for poorer social experiences than their peers who are typically developing (Beukelman & Mirenda, 2013; Blackstone & Hunt-Berg, 2003; Bedrosian et al., 1998; Kraus, 1995; McCarthy & Light, 2005; Shaver et al., 1989), making it important to identify interventions that improve attitudes toward AAC users. However, interventions must also be feasible. In this case, reauditorization improved attitudes toward the AAC user, while requiring no additional external equipment, and only requiring an additional 19 seconds of vocal productions by the communication partner (i.e., Bridget) during a 3 minute 50 second conversation. This suggests that when it comes to improving attitudes toward an individual who uses a nonelectronic AAC system, reauditorization may provide benefit without placing substantial burden on the AAC user or communication partner. Future research should seek effective strategies that both improve attitudes toward AAC users, and are easy for AAC users and their partners to implement.

The issues of effectiveness and efficaciousness of reauditorization are also worthy of future research attention. This study did not address the issues of effectiveness or efficaciousness, nor has any other previous study examining partner reauditorization. Reauditorization should be examined from a standpoint of its usefulness as a rate and intelligibility enhancement strategy and future research must also address these issues.

Conclusion

Understanding the variables that positively influence attitudes among potential communication partners is essential in allowing AAC users and interventionists to make informed decisions regarding AAC systems. In this study, partner reauditorization resulted in improved attitudes that participants reported about an individual who used nonelectronic AAC, and also resulted in improved reported ease of understanding the aided message and likelihood of peer interactions. Better understanding the variables that impact attitudes can contribute to the social inclusion of AAC users and can help reduce the barriers they experience. This study contributed to understanding attitudes, preferences, reported ease of understanding, and willingness to interact with an individual who used a nonelectronic AAC system, and contributed to addressing a void in the current evidence base regarding reauditorization. Future research is needed to continually advance knowledge about how interventionists can improve the social experiences of individuals who use AAC, and to enhance the evidence base that supports the interventionists who have the pleasure of serving individuals with severe communication disabilities.

Table 1

Summary of 30 Studies Meeting Inclusion Criteria Presented in Chronological Order

Author(s)	n=	Independent Variable(s)	Survey	Referent / AAC User	Respondents	Procedure	Results
Gorenflo & Gorenflo (1991)	151	1. Information sheet about AAC user. 2. SGD, Nonelectronic communication board, Unaided dysarthric speech	ATNP was developed for this study	22 year old male with CP	TD undergraduate students	Participants viewed videos depicting scripted conversation between AAC User and TD partner.	1. Information about AAC user > No information 2. SGD > Alphabet board 3. Alphabet board > Unaided
Bedrosian, Hoag, Calculator, Molineux (1992)	48	1. Message length 2. Reauditorization 3. Observer familiarity with AAC	Survey developed for this study	Adult male actor playing adult with CP	24 naïve TD adults and 24 SLPs	Participants viewed videos depicting scripted conversation between AAC User and TD partner.	1. No main or interaction effect for reauditorization associated with message length or observer familiarity 2. SLPs rated longer messages as more competent than shorter messages 3. Naïve TD adults rated short messages as more competent than SLPs rated short messages
Hoag & Bedrosian (1992)	48	1. Synthesized voice output, digitized voice output 2. Message length 3. Reauditorization	Survey from Bedrosian et al., 1992	Adult male actor playing adult with CP	48 naïve TD adults	Participants viewed videos depicting scripted conversation between AAC User and TD partner using same script as Bedrosian et al., (1992).	1. Significant for message length only; longer messages > Shorter messages
Macke (1992)	146	1. SGD, nonelectronic communication board	Survey developed for this study	Male child with CP using AAC; high school student using AAC;	TD university students	Participants viewed videos of AAC user answering scripted questions.	1. SGD > nonelectronic communication board

Raney & Silverman (1992)	69	2.	Nonelectronic alphabet board, Nonelectronic alphabet board with words and phrases	ATNP	The description of the individual who used AAC in Gorenflo & Gorenflo (1991)	TD university students	Participants reviewed a written description of the AAC User in Gorenflo & Gorenflo (1991) and a picture of an alphabet only communication board or an alphabet communication board that also had words and phrases. No interaction or video was observed.	1.	Nonelectronic alphabet board with words and phrases > Nonelectronic alphabet board only
Blockberger, Armstrong, O'Connor & Freeman (1993)	249	1. 2.	Unaided gestural, Nonelectronic alphabet board, SGD Respondent reading level, gender, and experience with children with disabilities	CATCH	Girl with hemiplegia	TD fourth grade children	Participants viewed videos depicting scripted conversation between AAC User and TD adult partner. Partner reauditorized finger spelling and nonelectronic alphabet board, but did not reauditorize SGD.	1. 2. 3. 4.	No difference for Unaided, Nonelectronic alphabet board, SGD Respondent with high reading level > Respondent with low reading level Female > Male Experience with children with disabilities > No experience
Hoag, Bedrosian, Johnson, & Molineaux (1994)	48	1. 2. 3.	Message length Reauditorization Respondent experience with AAC	Survey from Bedrosian et al., 1992	Adult male actor playing adult with CP	Same participants as Bedrosian et al., 1992; 24 naïve TD adults and 24 SLPs	Videos and scripts same as those used in Bedrosian et al. (1992) that depicted scripted conversation between AAC User and TD partner. Used specific data from Bedrosian et al. (1992) to examine social aspects only.	1. 2. 3.	Long message > Short message No difference for reauditorization Less experience with AAC (i.e. naïve adults) > More experience with AAC (i.e., SLPs)

Gorenflo & Gorenflo (1994)	284	<ol style="list-style-type: none"> 1. Synthesized speech gender 2. Ease of listening 3. Respondent gender 	ATNP	Adult female actor in wheelchair	TD university students enrolled in introductory special education course	Participants viewed videos depicting scripted conversation between AAC User and TD partner.	<ol style="list-style-type: none"> 1. No difference for synthesized speech gender 2. High ease of listening > Low ease of listening (Social interaction subscale only) 3. Female respondent > male respondent (General evaluation subscale only)
Beck & Dennis (1996)	186	<ol style="list-style-type: none"> 1. Nonelectronic alphabet board, SGD 2. Respondents' school integration policy (whether school integrated children with disabilities) 3. Respondent gender 	CATCH	13 year old male with CP in a wheelchair	TD fifth grade children	Participants viewed videos depicting non-scripted conversation between AAC User and TD adult SLP. AAC user also used gestural and vocal communication in both conditions. Adult SLP used reauditorization strategy after each letter and word in nonelectronic condition.	<ol style="list-style-type: none"> 1. Alphabet board no different from integrated schools > non-integrated 2. Integrated schools > non-integrated 3. Female > Male
Gorenflo & Gorenflo (1997)	95	<ol style="list-style-type: none"> 1. AAC user gender 2. Respondent gender 3. Synthetic voice gender 4. Perceived similarity between respondent and AAC user 	ATNP	Adult female actor in wheelchair; Adult male actor in wheelchair	TD university students majoring in education	Participants viewed videos depicting scripted conversation between AAC User and TD partner.	<ol style="list-style-type: none"> 1. Male rating male with high similarity > Male rating male with low similarity 2. Female rating Female with high similarity > Female rating female with low similarity 3. Female rating male with high similarity > Female rating male with low similarity 4. No difference for synthetic voice gender 5. Perceived similarity > No perceived similarity

Bedrosian, Hoag, Johnson & Calculator (1998)	12	1. Message length 2. Reauditorization	Survey from Bedrosian et al., 1992	Adult male actor playing adult with CP	Adults who were non-ambulatory and had diagnosis of CP	Participants viewed same videos depicting scripted conversation between AAC User and TD male partner from Bedrosian et al., 1992.	1. No effect for aided message length 2. No effect for reauditorization
Beck, Fritz, Keller & Dennis (2000)	128	1. Message length 2. Respondent age and gender 3. Physical disability (AAC user depicted with or without wheelchair) 4. SGD, nonelectronic communication board	AATAAC was developed for this study	TD child actor	TD first, third, and fifth grade children who were familiar with children with disabilities	Participants were shown a picture of either a child with or without a wheelchair and then viewed videos depicting scripted conversation between AAC User and TD partner. Only the AAC system and forearm of AAC user was visible. TD adult used reauditorization strategy in both conditions.	1. No main effect of message length 2. No main effect of AAC system 3. Boys in grade 1 > Boys in grade 3 > Boys in grade 5 4. Girls in grade 3 > Girls in grades 1 or 5 5. Grade 1 boys > Grade 1 girls 6. Grade 3 & 5 girls > Grade 3 & 5 boys 7. Grade 1 SGD without disability > Grade 1 SGD with disability 8. Grade 1 nonelectronic with disability > Grade 1 nonelectronic without disability 9. Grade 3 and 5 no effect for AAC system or presence of disability
Beck, Kingsbury, Neff & Dennis (2000)	172	1. Message length 2. Respondents' school integration policy (whether school integrated children with disabilities) 3. Respondent gender	AATAAC	TD child actor	TD third and fifth grade children	Participants viewed videos depicting scripted conversation between AAC User and adult SLP partner. Only the AAC system and forearm of AAC user was visible. Partner used reauditorization strategy in both conditions.	1. No main effect of message length 2. Integrated school students > Non-integrated school students 3. Integrated school long message no different from integrated school short message 4. Non-integrated school long message > Non-integrated school short message 5. Female > Male

Beck, Thompson, Clay, Hutchins, Vogt, Romaniak & Sokolowski (2001)	188	<ol style="list-style-type: none"> 1. SGD, nonelectronic communication board 2. Information indicating disability label (whether child had diagnosis of mental retardation and/or physical disability) 3. Competency of AAC user (number of turns and response latency) 	PARCCA was developed for this study	TD child actor	TD university students enrolled in introductory special education course	Participants viewed videos depicting scripted conversation between AAC User and TD adult partner. Only the AAC system and forearm of AAC user was visible. Adult used reauditorization strategy in all conditions.	<ol style="list-style-type: none"> 1. No effect for AAC system 2. No effect for disability label 3. High competency > low competency (Cognitive subscale only)
Beck, Bock, Thompson & Kosuwan (2002)	67	<ol style="list-style-type: none"> 1. SGD, nonelectronic communication board 2. Competence of AAC User (latency and need for prompting) 3. Participant gender and grade 	AATAAC	TD child actor	TD fourth and fifth grade children who were familiar with children with disabilities	Participants viewed videos depicting scripted conversation between AAC User and TD adult partner. Only the AAC system and forearm of AAC user was visible. Adult used reauditorization strategy in all conditions.	<ol style="list-style-type: none"> 1. No effect for competence of AAC user, AAC system, or grade 2. Female > Male
Dada & Alant (2002)	28	<ol style="list-style-type: none"> 1. Respondents' school integration policy (whether school integrated children with disabilities) 2. SGD, nonelectronic communication board 	TAS (Dada, 1999)	7 year old male with CP	28 TD adult school teachers	Participants viewed videos depicting scripted conversation between AAC User and TD adult partner.	<ol style="list-style-type: none"> 1. No effect for integration policy 2. No effect for AAC system.

Lilienfeld & Alant (2002)	115	1. SGD with and without voice output 2. Respondent gender	CADAQ was developed for this study	13 year old male with CP	TD sixth and seventh grade children who attended a non-integrated school	Participants viewed videos depicting scripted conversation between AAC user and TD 15 year old female partner. Partner could not be seen on the video and reauditorization strategy was not used.	1. SGD > Nonelectronic AAC system 2. Female > Male
Bedrosian, Hoag, & McCoy (2003)	96	1. Relevance of message 2. Rate of communication 3. Use of floor holder (e.g., Please give me a minute while I construct my message) 4. Respondent and AAC user gender	Survey developed for this study	Adult male and female with CP and dysarthria in wheelchair	TD adult salesclerks	Participants viewed videos depicting scripted conversation between AAC user and TD adult salesclerk.	1. Slow rate, relevant messages > Fast rate, inadequate message 2. Slow rate with floor holder > slow rate without floor holder 3. No effect for gender
Richter, Ball, Beukelman, Lasker & Ullman (2003)	45	1. Unaided dysarthric speech, SGD, nonelectronic communication book 2. Respondents with dysarthria, familiar with people with dysarthria, unfamiliar with people with dysarthria	Survey developed for this study	41 year old male with dysarthria and ALS	10 adults with dysarthria and ALS; 8 adults familiar with people with ALS and dysarthria; 27 adults unfamiliar with people with dysarthria	Participants viewed videos depicting AAC User telling scripted narratives. Adult used reauditorization strategy in nonelectronic condition.	1. No main effect for SGD vs communication book 2. SGD > Unaided dysarthric speech 3. Nonelectronic communication book > Unaided dysarthric speech 4. Interaction effects were detected
	41	1. Respondents with dysarthria, familiar with people with dysarthria, unfamiliar with	Survey developed for this study	41 year old male with dysarthria and ALS	9 adults with dysarthria and ALS; 7 adults familiar with people with	The video used in Study 1 was edited to give the impression that the individual who uses AAC was	1. Complete narrative > Sentence by sentence > Word by word 2. No effect for respondent type

			people with dysarthria			ALS and dysarthria; 25 adults unfamiliar with people with dysarthria	communicating using each of the three formulation techniques.	
		2.	Formulation technique (word by word, sentence by sentence, complete narrative)					
Hoag, Bedrosian, McCoy & Johnson (2004)	96	1. 2. 3.	Amount of information (too much or too little) Rate of communication Gender of AAC user, salesclerk, and respondent	Survey developed for Bedrosian et al., (2003)	Adult male and female with CP and dysarthria in wheelchair	TD adult salesclerks	Participants viewed videos depicting scripted conversation between AAC user and TD adult salesclerk. Same scripts as Bedrosian et al. (2003).	1. Adequate information and faster messages > Too much or little information, slower messages 2. No effect for gender
Beck, Bock, Thompson, Bowman & Robbins (2006)	84	1. 2.	Formal English with or without age appropriate informal terms Respondent gender and grade	AATAAC	TD child actor	Fourth and fifth grade children	Participants viewed videos depicting scripted conversation between AAC user and TD adult partner.	1. No effect for age appropriate terms 2. Female > Male 3. Grade 5 girls > Grade 4 girls 4. Grade 4 boys > Grade 5 boys
Dudek, Beck, & Thompson (2006)	60	1. 2.	Dynamic vs static display Respondent gender	AATAAC	Child; not specified as actor	Children in grades 3 and 5	Participants viewed videos depicting scripted conversation between AAC user and TD adult partner. Only the AAC system and forearm of AAC user was visible.	1. Female > male 2. No effect of display type
McCoy, Bedrosian, Hoag, & Johnson (2007)	96	1. 2.	Rate of communication Repetitiveness of message	Survey developed for Bedrosian et al., (2003)	Adult male and female with CP and dysarthria in wheelchair	TD adult salesclerks	Participants viewed videos depicting scripted conversation between AAC user and TD adult salesclerk from Bedrosian et al. (2003), Hoag et al. (2004).	1. Faster rate with repetition > slower rate with or without repetition

Hoag, Bedrosian, McCoy, & Johnson (2008)	96	1.	Type of error (repetitive message, excessive information, inadequate information, partly relevant plus excessive information)	Survey developed for Bedrosian et al., (2003)	Adult male and female with CP and dysarthria in wheelchair	TD adult salesclerks	Participants viewed videos depicting scripted conversation between AAC user and TD adult salesclerk. Same scripts as Bedrosian et al. (2003), Hoag et al. (2004), and McCoy et al. (2007).	<ol style="list-style-type: none"> 1. Faster message rate > Slower message rate 2. Repetitive message > Message with excessive information > message with inadequate information > message with partly relevant plus excessive information
Beck, Thompson, Kosuwan & Prochnow (2010)	136	<ol style="list-style-type: none"> 1. 2. 3. 	<p>Static display, dynamic display</p> <p>Gender of AAC user, conversation partner, and respondent</p> <p>Respondent familiarity with individuals with disabilities</p>	AATAAC-2 was developed for this study	TD male and female actors	14 to 18 year old individuals	Participants viewed videos depicting scripted conversation between AAC user and TD conversation partner. Only the AAC system and forearm of AAC user was visible.	<ol style="list-style-type: none"> 1. Female respondent > Male respondent 2. No effect of gender of AAC user or conversation partner 3. No effect of display 4. Familiarity of individuals with disabilities > Less familiarity with individuals with disabilities
Kanarowski (2012)	71	1.	Bibliotherapy	AAC Acceptance Scale for Young Children was developed for this study	Not applicable	First grade children	Children were read a book about child who used AAC or a control book about a child who did not use AAC, then discussed the book.	<ol style="list-style-type: none"> 1. No effect for overall or cognitive subscale ratings 2. Affective and behavioral subscale ratings were more negative for bibliotherapy group
Kim, Kim, Lee & Park (2015)	72	1.	Type of error (semantic, syntactic, or pragmatic)	Korean translation of survey developed for Bedrosian et al., (2003)	10 year old boy with CP	TD naïve, Korean adults	Participants viewed videos depicting scripted, Korean conversation between AAC user and TD conversation partner.	<ol style="list-style-type: none"> 1. Pragmatic and syntactic error > Semantic error

McCarthy, Donofrio-Horowitz & Smucker (2015)	109	1.	Information about AAC user	ATNP	30 year old male with disability in a wheelchair	University students majoring in business	Viewed a picture of AAC user. Read a personal narrative about AAC user or a control reading.	1. Information about AAC user > Control reading
Achmadi, van der Meer, Sigafos, Lancioni, O'Reilly, Lang, Schlosser, Hodis, Green, Sutherland, McLay & Marschik (2015)	104	1.	Unaided gestural communication, nonelectronic communication card, SGD	Survey developed for this study	TD adult female actor	Undergraduate college students enrolled in an education course.	Participants viewed videos depicting requesting more food from TD conversation partner.	1. SGD > nonelectronic > gestural (Intelligibility subscale only) 2. SGD > nonelectronic > gestural (Effectiveness subscale only) 3. SGD > gestural > nonelectronic (Preference subscale only)
Hyppa-Martin, Collins, Chen, Amundson, Timinski & Mizuko (2016)	115	1. 2.	SGD, nonelectronic communication board Respondent gender	AATAAC	TD first grade actor	First grade children	Participants viewed videos depicting scripted conversation between AAC user and TD conversation partner. Only the AAC system and forearm of AAC user was visible. Adult used reauditorization strategy in nonelectronic condition.	1. No effect of AAC system 2. SGD > nonelectronic for both use by self and others (Preference subscale only) 3. Female > Male

Note. TD = Typically developing, CP = cerebral palsy, ALS = Amyotrophic Lateral Sclerosis. AATAAC = Assessment of Attitudes Toward Augmentative/Alternative Communication (Beck, Fritz et al., 2000); ATNP = Attitudes Toward Nonspeaking Persons (Gorenflo & Gorenflo, 1991); CADAQ = Communication Aid/Device Attitudinal Questionnaire (Lilienfeld & Alant, 2002); CATCH = Chedoke-McMaster McMaster Attitudes Toward Children with Handicaps (Rosenbaum, Armstrong, & King, 1986a); PARCA = Professionals' Attitudes Regarding Children who Communicate Augmentatively (Beck et al., 2001). TAS = Teacher Attitudinal Scale (Dada & Alant, 2002).

Table 2

Participant Characteristics

Demographic Variable	Participant Response	Number of Participants
Age	18	n=14
	19	n=41
	20	n=8
	27	n=1
Year in college	Freshman	n=49
	Sophomore	n=13
	Junior	n=1
	No Response	n=1
Major	Biology	n=1
	Business	n=1
	Communication Arts	n=1
	Communication Sciences & Disorders	n=24
	Education	n=2
	Math	n=1
	Psychology	n=4
	Social Work	n=1
	Special Education	n=24
Undecided	n=3	
Experience working in a paid position with persons with disabilities	Never	n=37
	1 to 40 hours	n=16
	41 to 160 hours	n=2
	More than 160 hours	n=9
Experience interacting with persons with disabilities	Never	n=2
	1 to 40 hours	n=22
	41 to 160 hours	n=12
	More than 160 hours	n=28
Experience interacting with persons who use AAC	Never	n=39
	1 to 40 hours	n=19
	41 to 160 hours	n=3
	More than 160 hours	n=3
AAC Training	Never	n=52
	1 to 5 hours	n=12

Note. All participants were female, fluent in English per university entry requirements, and self-reported a history of typical development.

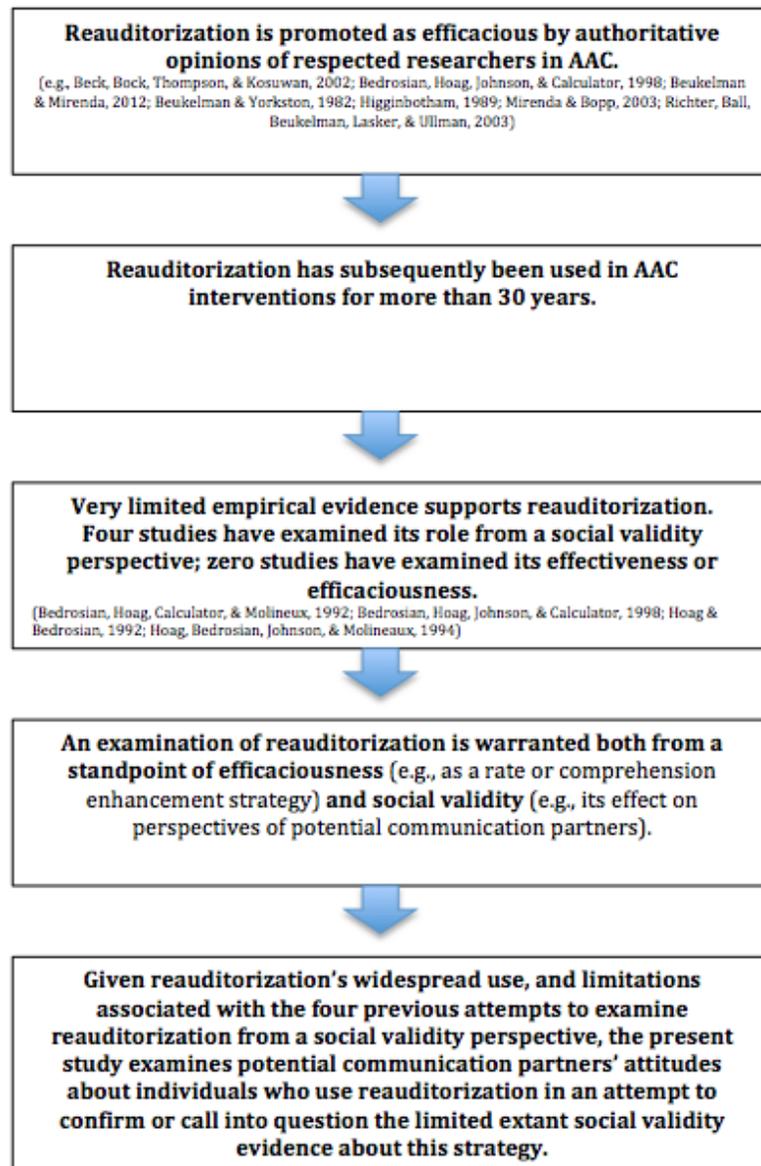


Figure 1. Flowchart depicting the history of reauditorization and rationale warranting the present study.

1 2 3 4 5 6 7 8 9 0

A	About	Afraid	Am	And	Are	Been	Bottle	But	By
Cancelled	Changed	Classes	Computer	Distracted	Don't	Due	Except	Fast	For
Game	Glad	Go	Going	Good	Got	Great	Have	Homework	I
I'd	I'm	In	Instead	Is	It	Last	Lately	Like	Me
Minutes	Monday	Moved	My	Need	New	Nice	Night	Of	One
Paper	Seems	Settings	Share	Start	Starting	Stuff	Test	That	The
Then	Though	Thought	To	Together	Tomorrow	Tonight	Too	Up	Was
Watch	Watching	Water	We	Week	Were	What	When	Why	Work
Yes	You								

Sunday Monday Tuesday Wednesday Thursday Friday Saturday

A	B	C	D		
E	F	G	H		
I	J	K	L	M	N
O	P	Q	R	S	T
U	V	W	X	Y	Z

Figure 2. Display of 8.5 in. x 11 in. nonelectronic AAC System.



Figure 3. Screen shot of Bridget and John in the experimental videos.

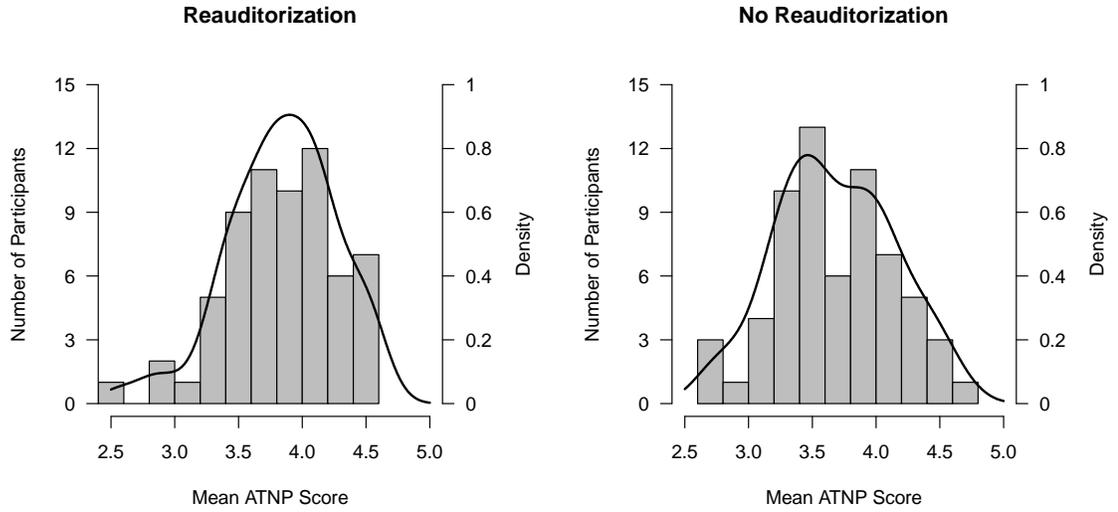


Figure 4. Histograms of number of participants with mean ATNP score and estimated kernel density displaying generally normal distributions of mean ATNP scores for reauditorization condition in the left panel, and no reauditorization condition in the right panel.

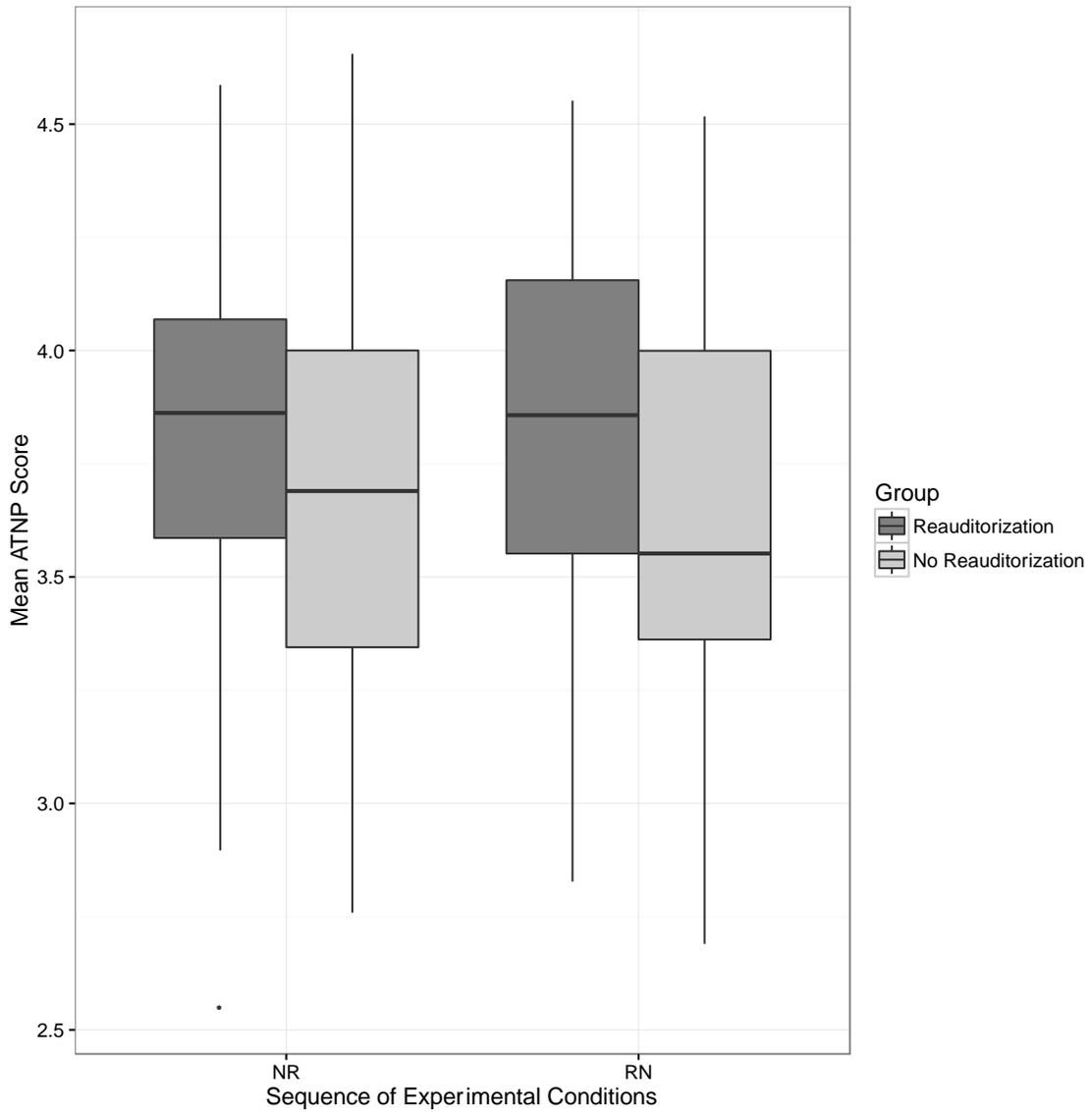


Figure 5. Box plots of mean ATNP scores of participants whose block (i.e., sequence of conditions) was no reauditorization followed by reauditorization (NR) on the left, and participants whose sequence of conditions was reauditorization followed by no reauditorization (RN) on the right.

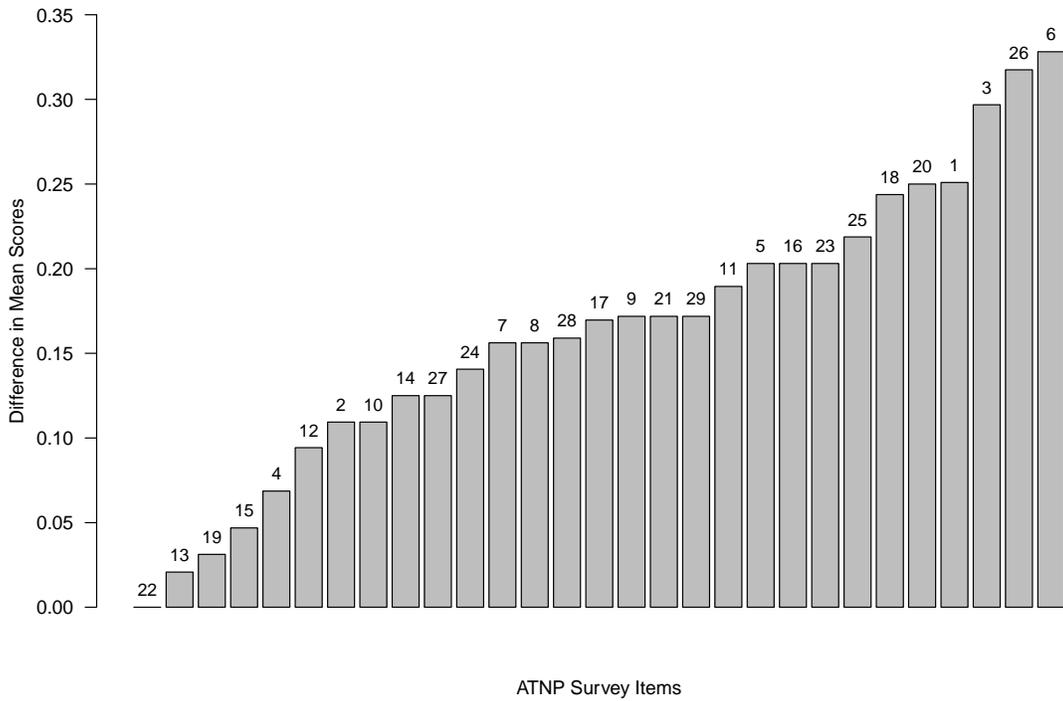


Figure 6. Differences in mean scores for each item of the ATNP (labeled items 1-29) between reauditorization and no reauditorization conditions.

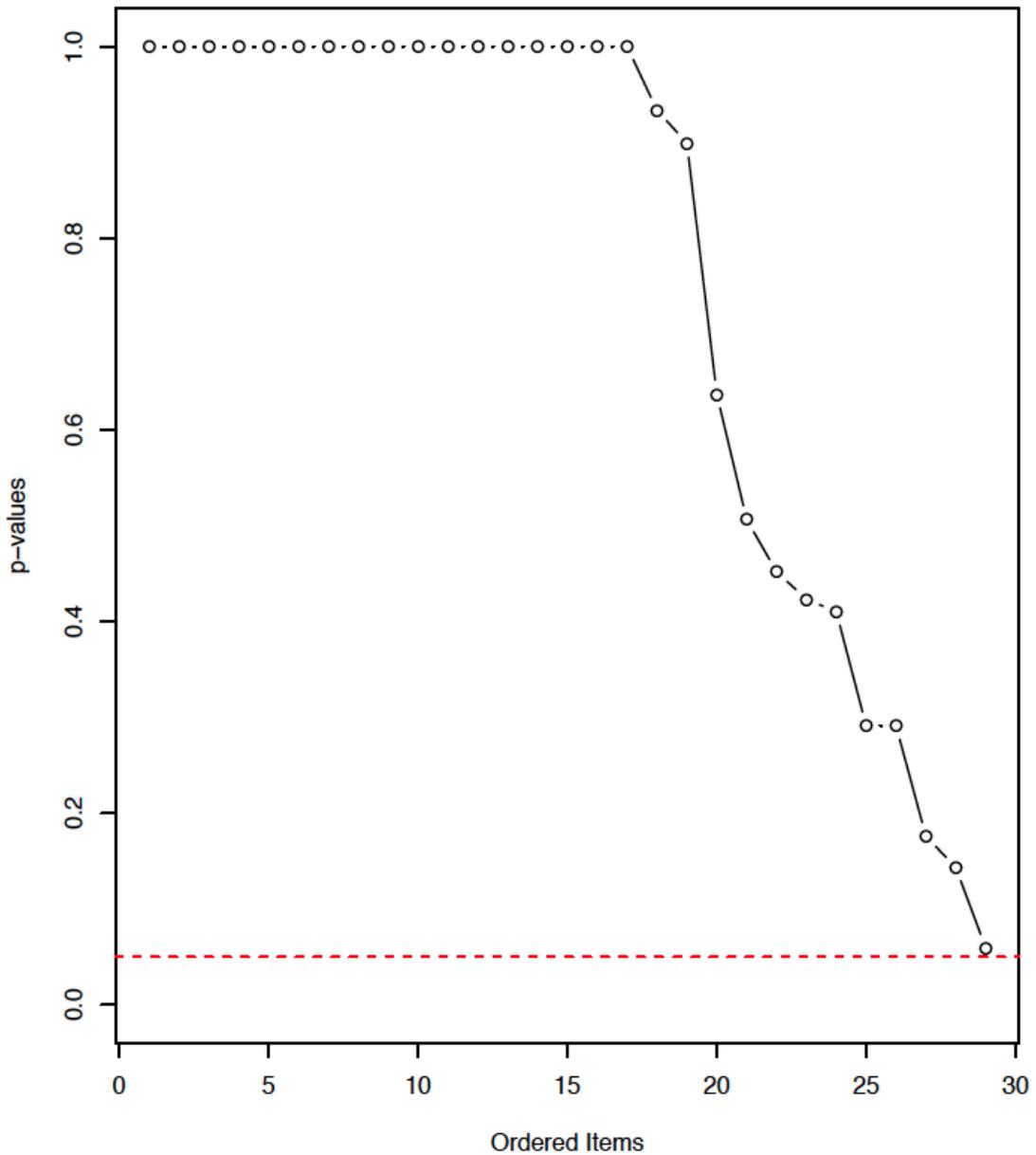


Figure 7. The ordered p -values for item-level analysis of each of the 29 ATNP items, adjusted according to the Holm-Bonferroni correction (Holm, 1979). No p -values fall below the line which marks $p = 0.05$, indicating no significant differences between conditions at the item level.

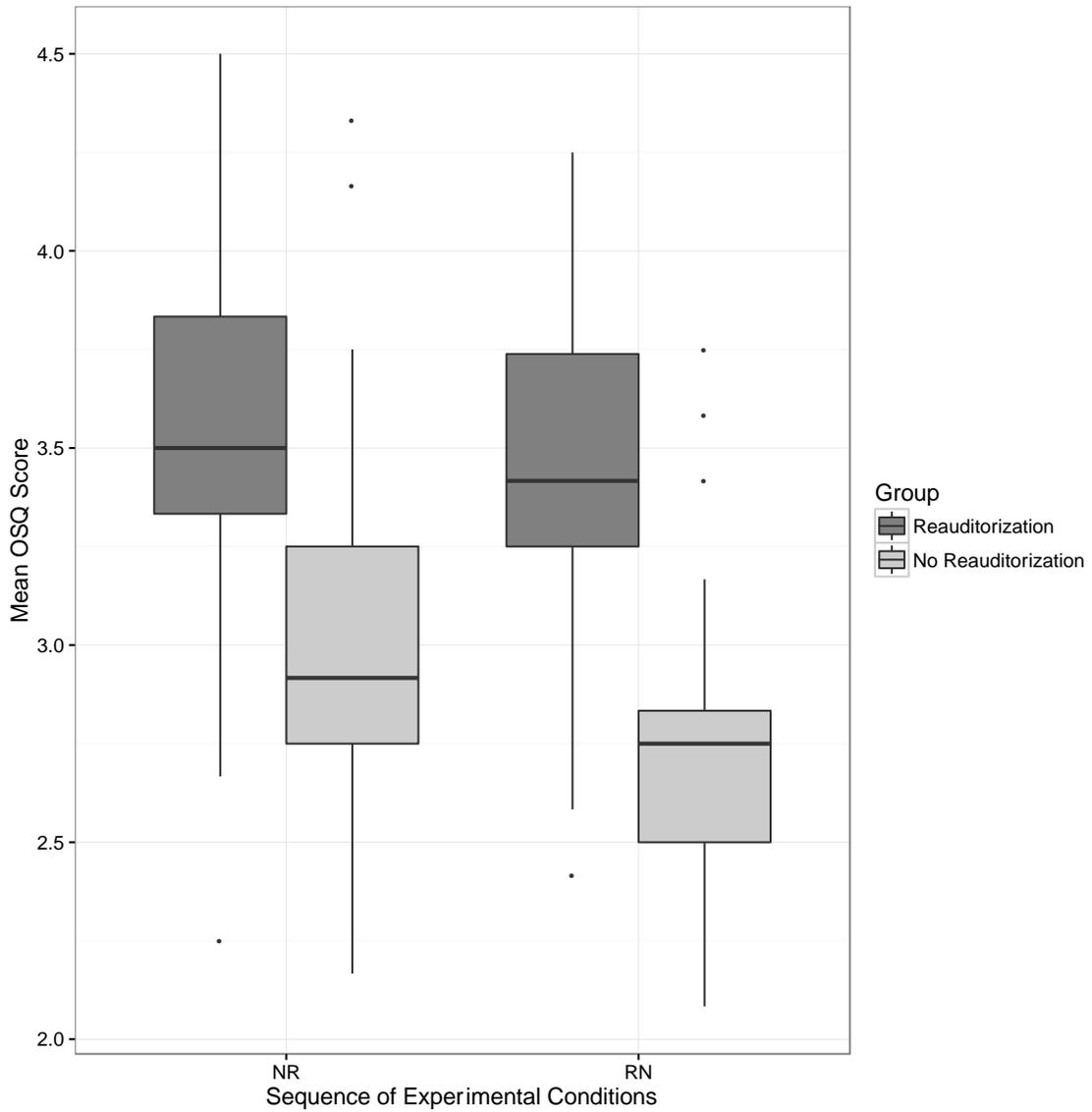


Figure 8. Box plots of overall mean scores on the 12 original survey questions (OSQ) for participants receiving no reauditorization followed by reauditorization (NR) on the left, and participants whose sequence of conditions was reauditorization followed by no reauditorization (RN) on the right.

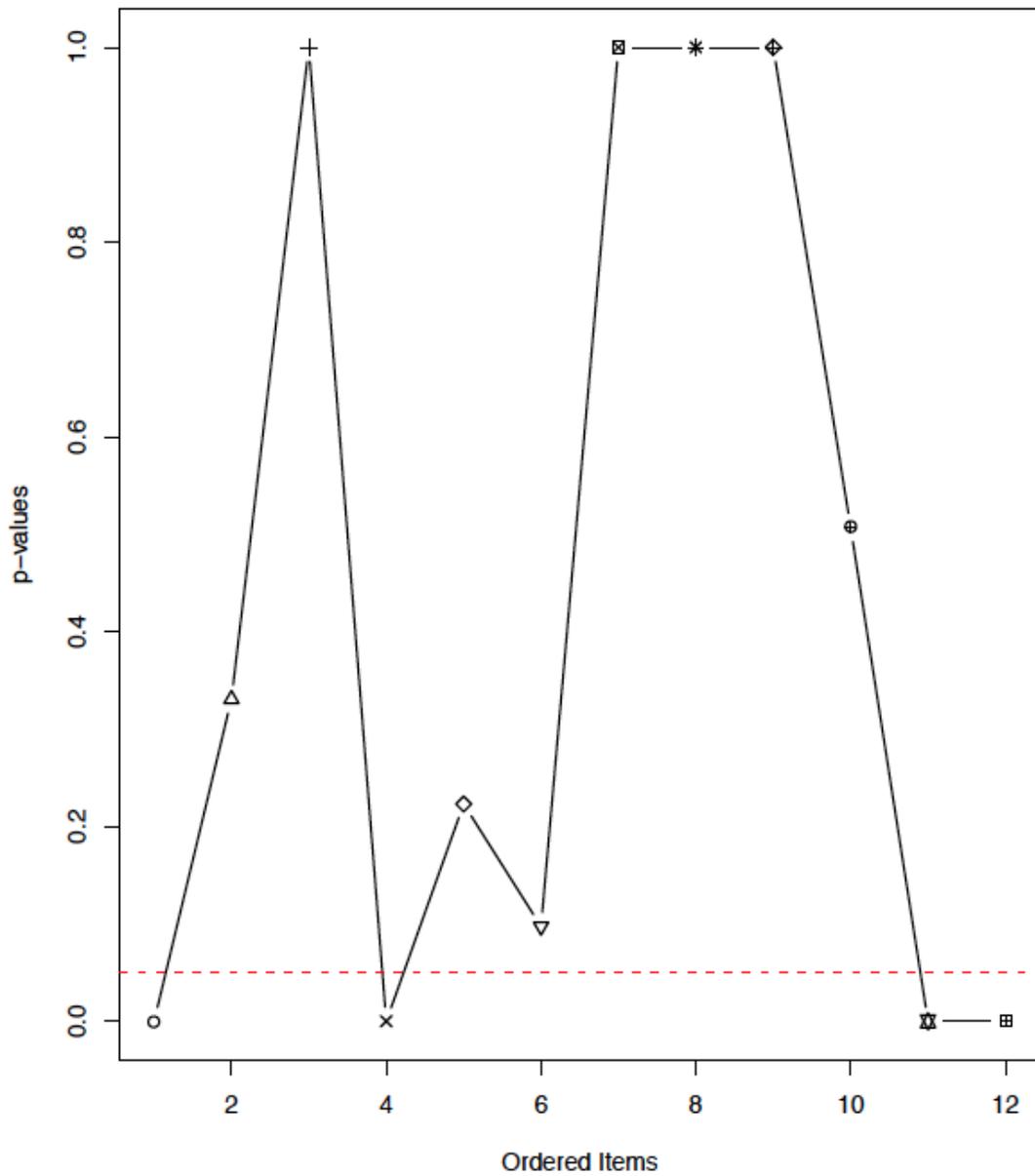


Figure 9. Ordered p-values for 12 OSQ items, adjusted according to the Holm-Bonferroni correction (Holm, 1979). Significant items on the plot (i.e., items 1, 4, 11, and 12) have p-values below the dotted line which marks $p = 0.05$.

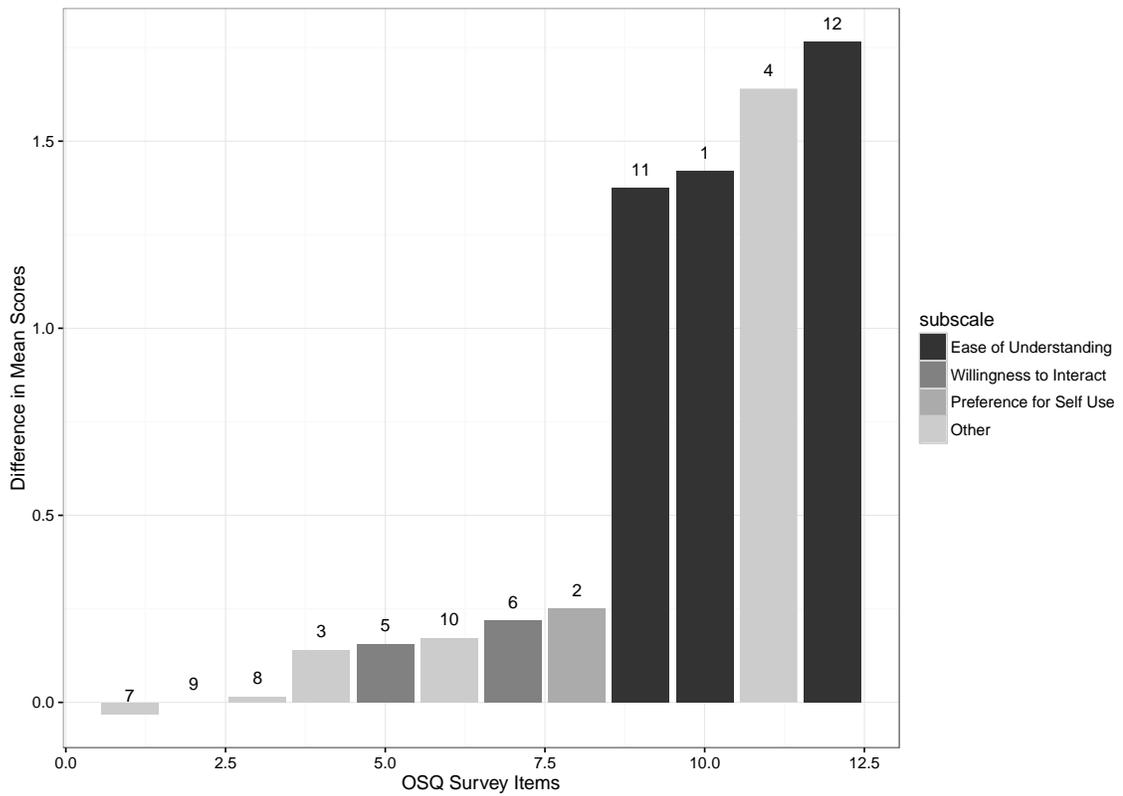


Figure 10. Differences in mean scores for each OSQ item (labeled 1-12) between the two conditions (reauditorization versus no reauditorization). Each item is shaded to represent its respective subscale.

References

- Achmadi, D., van der Meer, L., Sigafoos, J., Lancioni, G. E., O'Reilly, M. F., Lang, R., ... Marschik, P. B. (2015). Undergraduates' perceptions of three augmentative and alternative communication modes. *Developmental Neurorehabilitation, 18*, 22-25.
- American Speech-Language-Hearing Association. (2015). *Augmentative and alternative communication*. Retrieved from:
<http://www.asha.org/public/speech/disorders/AAC/>
- Batorowicz, B., Campbell, F., von Tetzchner, S., King, G., & Missiuna, C. (2014). Social participation of school-aged children who use communication aids: The views of children and parents. *Augmentative and Alternative Communication, 30*, 237-251.
- Beck, A., Bock, S., Thompson, J., & Kosuwan, K. (2002). The influence of communicative competence and AAC technique on children's attitudes toward a peer who uses AAC. *Augmentative and Alternative Communication, 18*, 217-227.
- Beck, A., & Dennis, M. (1996). Attitudes of children toward a similar-aged child who uses augmentative communication. *Augmentative and Alternative Communication, 12*, 78-87.
- Beck, A., Fritz, H., Keller, A., & Dennis, M. (2000). Attitudes of school-aged children toward their peers who use AAC. *Augmentative and Alternative Communication, 16*, 13-26.

- Beck, A., Kingsbury, K., Neff, A., & Dennis, M. (2000). The influence of length of augmented message on children's attitudes toward peers who use AAC. *Augmentative and Alternative Communication, 16*, 239-249.
- Beck, A., Thompson, J., Clay, S., Hutchins, M., Vogt, P., Romaniak, B., & Sokolowski, B. (2001). Preservice professionals' attitudes toward children who use augmentative/alternative communication. *Education and Training in Mental Retardation and Developmental Disabilities, 36*, 255-271.
- Beck, A., Thompson, J., Kosuwan, K., & Prochnow, J. (2010). The development and utilization of a scale to measure adolescents' attitudes toward peers who use AAC Devices. *Journal of Speech, Language, and Hearing Research, 53*, 572-587.
- Bedrosian, J., Hoag, L., Calculator, S., & Molineux, B. (1992). Variables influencing perceptions of the communicative competence of an adult augmentative and alternative communication system user. *Journal of Speech and Hearing Research, 35*, 1105 – 1113.
- Bedrosian, J., Hoag, L., Johnson, D., & Calculator, S. (1998). Communicative competence as perceived by adults with severe speech impairments associated with cerebral palsy. *Journal of Speech, Language, and Hearing Research, 41*, 667 – 675.
- Beukelman, D., & Mirenda, P. (2013). *Augmentative and alternative communication: Management of severe communication disorders in children and adults*. (4th ed.). Baltimore, MD: Brookes Publishing.

- Beukelman, D., & Yorkston, K. (1982). Communication interaction of adult communication augmentation system use. *Topics in Language Disorders*, 2, 2, 39-53.
- Blackstone, S., & Hunt-Berg, P. (2003). *Social networks: A communication inventory for individuals with complex communication needs and their communication partners*. Monterey, CA: Augmentative Communication.
- Blockberger, S., Armstrong, R., O'Connor, A., & Freeman, R. (1993). Children's attitudes toward a nonspeaking child using various augmentative and alternative communication techniques. *Augmentative and Alternative Communication*, 9, 243-250.
- Boesch, M., Wendt, O., Subramanian, A. & Hsu, N. (2013). Comparative efficacy of the picture exchange system (PECS) versus a speech-generating device: Effects on social-communicative skills and speech development. *Augmentative and Alternative Communication*, 29, 3, 197-209.
- Calculator, S. N. & Black, T. (2009). Validation of an Inventory of Best Practices in the Provision of Augmentative and Alternative Communication Services to Students With Severe Disabilities in General Education Classrooms. *American journal of speech language pathology*, 18, 4, 329-342.
- Chickering, A., & Reisser, L. (1993). *Education and identity*. San Francisco: Jossey-Bass.
- Dada, S., & Alant, E. (2002). A comparative study of the attitudes of teachers at special and educationally inclusive schools towards learners with little or no functional

- speech using communication devices. *South African Journal of Education*, 22, 213-218.
- Dudek, K., Beck, A., & Thompson, J. (2006). The influence of AAC device type, dynamic vs. static screen, on peer attitudes. *Journal of Special Education Technology*, 21, 1, 17-27.
- Eagly, A., & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth, TX: Harcourt Brace Jovanovich College Publishers.
- Eagly, A., & Chaiken, S. (2007). The advantages of an inclusive definition of attitude. *Social Cognition*, 25, 582–602.
- Ellis, P. (2010). *The Essential Guide to Effect Sizes: An Introduction to Statistical Power, Meta-Analysis and the Interpretation of Research Results*. United Kingdom: Cambridge University Press.
- Fishman, S., Timler, G., & Yoder, D. (1985). Strategies for the prevention and repair of communication breakdown in interactions with communication board users. *Augmentative and Alternative Communication*, 1, 38-51.
- Ganz, J. (2014). *Aided augmentative communication for individuals with autism spectrum disorders*. New York, NY: Springer.
- Gorenflo, C. (1986). *The effect of information and augmentative communication technique on attitudes toward non-speaking individuals*. Doctoral dissertation, Michigan State University, East Lansing, MI. Retrieved from ProQuest Dissertations and Theses database. (Order ID 700272538.)

- Gorenflo, C., & Gorenflo, D. (1991). The effects of information and augmentative communication technique on attitudes toward nonspeaking individuals. *Journal of Speech and Hearing Research, 34*, 19-26.
- Gorenflo, C., & Gorenflo, D. (1994). Effects of synthetic voice output attitudes toward the augmented communicator. *Journal of Speech & Hearing Research, 37*, 64-69.
- Gorenflo, D., & Gorenflo, C. (1997). Effects of synthetic speech, gender and perceived similarity on attitudes toward the augmented communicator. *Augmentative and Alternative Communication, 13*, 87-91.
- Gorenflo, C. W., Gorenflo, D., & Santer, S. (1994). Effects of synthetic voice output on attitudes toward the augmented communicator. *Journal of Speech and Hearing Research, 37*, 64-68.
- Haynes, W. & Johnson, C. (2009). *Understanding Research and Evidence-based Practice in Communication Disorders: A Primer for Students and Practitioners*. Pearson: Boston, MA.
- Higginbotham, D. J. (1989). The interplay of communication device output mode and interaction style between nonspeaking persons and their speaking partners. *Journal of Speech and Hearing Disorders, 54*, 320-333.
- Hoag, L., & Bedrosian, J. (1992). Effects of speech output type, message length, and reauditorization on perceptions of the communicative competence of an adult AAC user. *Journal of Speech, Language, and Hearing Research, 35*, 1363-1366.

- Hoag, L., Bedrosian, J., Johnson, D. & Molineux, B. (1994). Variables affecting perceptions of social aspects of the communicative competence of an adult AAC user. *Augmentative and Alternative Communication*, 10, 3, 129-137.
- Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, 6, 2, 65–70.
- Hyde, M. (2000). Reasonable psychometric standards for self-report outcome measures in audiological rehabilitation 8300 defect for UNSW. *Ear and Hearing*, 21, 4, 24-36.
- Hyppa-Martin, J., Collins, D., Chen, M., Amundson, C., Timinski, K., & Mizuko, M. (2016) Comparing First Graders' Attitudes and Preferences Toward a Peer Using an iPad-Based Speech-Generating Device and a Non-Electronic AAC System. *Augmentative and Alternative Communication*, 32, 2, 1-11.
- Johnston, S., Reichle, J., Feeley, K. & Jones, E. (2012). *AAC strategies for individuals with moderate to severe disabilities*. Baltimore, MD: Brookes Publishing.
- Kanarowski, E. (2012). *The influence of bibliotherapy on children's attitudes toward peers who use augmentative and alternative communication*. Unpublished doctoral dissertation, The University of Utah, Salt Lake City, UT.
- Kent-Walsh, J., & Light, J. (2003). General Education Teachers' Experiences with Inclusion of Students Who Use Augmentative and Alternative Communication. *Augmentative and Alternative Communication*, 19, 2, 104-124.

- Kim, J., Kim, Y., Lee, H., & Park, E. (2015). Influence of message error type on Korean adults' attitudes toward an individual who uses augmentative and alternative communication. *Augmentative and Alternative Communication, 31*, 2, 137-47.
- King, J. (2015, October 1). *Service delivery: SLPs who monitor adults with low tech*. Retrieved from <http://cehs.unl.edu/aac/demographic-information/>.
- Kraus, S. (1995). Attitudes and the prediction of behavior: A meta-analysis of the empirical literature. *Personality and Social Psychology Bulletin, 21*, 58-75.
- Light, J., Page, R., Curran, J., & Pitkin, L. (2007). Children's ideas for the design of AAC assistive technologies for young children with complex communication needs. *Augmentative and Alternative Communication, 23*, 274-287.
- Lilienfeld, M., & Alant, E. (2002). Attitudes of children toward an unfamiliar peer using an AAC device with and without voice output. *Augmentative and Alternative Communication, 18*, 91-101.
- Macke, R. (1992). *Preservice teacher attitudes towards nonvocal individuals using high-technology augmentative alternative communication devices versus low-technology communication boards*. Unpublished Dissertation, University of North Texas, Denton, TX.
- McCarthy, J., Donofrio-Horwitz, L., & Smucker, L. (2010). The effects of reading personal narratives written by an individual who uses AAC on the attitudes of pre-professionals in business. *Augmentative and Alternative Communication, 26*, 61-74.

- McCarthy, J., & Light, J. (2005). Attitudes toward individuals who use augmentative and alternative communication: Research review. *Augmentative and Alternative Communication, 21*, 41-55.
- McNaughton, D., & Bryen, D. (2002). Enhancing participation in employment through AAC technologies. *Assistive Technology, 14*, 58–70.
- McCoy, K., Bedrosian, J., Hoag, L., & Johnson, D. (2007) Brevity and speed of message delivery trade-offs in augmentative and alternative communication, *Augmentative and Alternative Communication, 23*, 1, 76-88
- McLay, L., van der Meer, L., Schäfer, M. C. M., Couper, L., McKenzie, E., O'Reilly, M. F., ... Sutherland, D. (2015). Comparing Acquisition, Generalization, Maintenance, and Preference Across Three AAC Options in Four Children with Autism Spectrum Disorder. *Journal of Developmental and Physical Disabilities, 27*, 3, 323-339.
- McNaughton, D., & 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*, 107-116.
- McNaughton, D., Light, J., & Arnold, K. (2002). “Getting your wheel in the door”: Successful full-time employment experiences of individuals with cerebral palsy who use augmentative and alternative communication. *Augmentative and Alternative Communication, 18*, 59 – 76.

- Mirenda, P., & Bopp, M. (2003). Playing the game: Strategic competence in AAC. In J. Light, D. Beukelman, & J. Reichle (Eds.), *Communicative competence for individuals who use AAC* (p. 401-440). Baltimore: Paul Brookes.
- Pascarella, E., & Terenzini, P. (2005). *How college affects students: A third decade of research* (2nd Ed.). San Francisco: Jossey-Bass.
- R Core Team (2016). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Retrieved from: <http://www.R-project.org/>.
- Raney, C., & Silverman, F. (1992). Attitudes toward nonspeaking individuals who use communication boards. *Journal of Speech and Hearing Research*, 35, 1269 – 1271.
- Reichle J, & Sigafoos J. (1991). *Implementing augmentative and alternative communication: Strategies for learners with severe disabilities*. Baltimore: Brookes.
- Richter, M., Ball, L., Beukelman, L., Lasker, D., & Ullman, C. (2003). Attitudes toward communication modes and message formulation techniques used for storytelling by people with amyotrophic lateral sclerosis. *Augmentative and Alternative Communication*, 19, 3,170-186.
- Rummel-Hudson, R. (2011). A revolution at their fingertips. *Perspectives on Augmentative and Alternative Communication*, 20, 19-23.
- Schlosser, R. (1999). Social validation of interventions in augmentative and alternative communication. *Augmentative and Alternative Communication*, 15, 234 – 237.

- Schlosser, R. W. (2003). Validity. In R. W. Schlosser (Ed.), *The efficacy of augmentative and alternative communication: Toward evidence-based practice* (p. 27–42). San Diego, CA: Academic Press.
- Shaver, J., Curtis, C., & Strong, C. (1989). The modification of attitudes toward persons with disabilities: Is there a best way? *International Journal of Special Education*, 4, 33–57.
- Snell, M., Brady, N., McLean, L., Ogletree, B., Siegel, E., Sylvester, L... & Sevcik, R. (2010). Twenty years of communication intervention research with individuals who have severe intellectual and developmental disabilities. *American Journal on Intellectual and Developmental Disabilities*, 115, 364–380.
- Soto, G. (1997) Special education teacher attitudes toward AAC: preliminary survey, *Augmentative and Alternative Communication*, 13, 3, 186-197.
- Triandis, H. (1971). *Attitudes and attitude change*. New York: Wiley.
- van der Meer, L., Sigafoos, J., O'Reilly, M., & Lancioni, G. (2011). Assessing preferences for AAC options in communication interventions for individuals with developmental disabilities: A review of the literature. *Research in Developmental Disabilities*, 32, 1422-1431.
- Unger, D. (2002). Employers' attitudes toward persons with disabilities in the workforce: Myths or realities? *Focus on Autism & Other Developmental Disabilities*, 17, 1, 2–11.

- Williams, M. B., Krezman, C., & McNaughton, D. (2008). "Reach for the stars": Five principles for the next 25 years of AAC. *Augmentative and Alternative Communication, 24*, 194-206.
- Wong, C., Odom, S., Hume, K., Cox, A., Fettig, A., Kucharczyk, S...& Schultz, T. (2015). Evidence-based practices for children, youth, and young adults with autism spectrum disorder: A comprehensive review. *Journal of Autism and Developmental Disorders, 45*, 1951-1966.
- Yuker, H., Block, J., & Young, G. (1966). *The measurement of attitudes toward disabled persons*. Albertson, NY: Human Resources Center.
- Zimmerman, D.W., Zumbo, B.D., & Lalonde, C. (1993). Coefficient alpha as an estimate of test reliability under violation of two assumptions. *Educational and Psychological Measurement, 53*, 33-49.

Appendix A

Conversational Script

Bridget: All right, is this the right place? [Bridget pushes John in a partner propelled wheelchair into medical setting waiting room and positions him next to an empty chair.]

Bridget: How's that? Oh, I need to put your brakes on. [Engages brakes on John's wheelchair]. So, when is your appointment?

John: IN 1-0 MINUTES

Bridget Reauditorization: In ten minutes.

Bridget: See, I told you I'm a good driver.

John: EXCEPT WHEN YOU H-I-T THAT S-Q-U-I-R-R-E-L LAST WEEK.

Bridget Reauditorization: Except when I hit that squirrel last week.

Bridget: OK, listen here, that squirrel hit me. I didn't hit it.

John: WHAT HAVE YOU BEEN UP TO LATELY?

Bridget Reauditorization: What have I been up to lately?

Bridget: School, studying, the usual.

John: I'M GLAD THAT D-R S-Y-M-O-N-S CANCELED THE TEST TOMORROW.

Bridget Reauditorization: You're glad that Dr Symons canceled the test tomorrow.

Bridget: Yeah, I am too. Plus, I have a paper due Monday.

John: ME TOO. DUE MONDAY.

Bridget Reauditorization: You too. Due Monday.

John: I WORKED A LITTLE ON IT LAST NIGHT. THEN I GOT DISTRACTED BY F-A-C-E-B-O-O-K AND N-E-T-F-L-I-X.

Bridget Reauditorization: You worked on it a little last night. Then you got distracted by Facebook and Netflix.

Bridget: You crack me up, John, but I know how that goes. It's usually Tumblr for me.

John: WATER BOTTLE.

Bridget Reauditorization: Water bottle.

Bridget: Oh, I'll go get it.

John: YES. GO FAST THOUGH.

Bridget Reauditorization: Yes. Go fast though.

Bridget: I think I have a few minutes before your appointment. I'll be right back.

Note: Bridget's utterances and Bridget's reauditorizations were produced via Bridget's natural speech. John's utterances were produced using a paper nonelectronic AAC system placed on his wheelchair tray that he directly selected by pointing his finger to whole words (depicted in all caps with no dashes) or to letters to spell words (depicted in all caps with dashes between letters). The words and text on John's AAC device display were not visible to participants. None of the turns marked "Bridget Reauditorization" were produced during the video that depicted the conversation without reauditorization, but the scripts were otherwise identical for both conditions.

Appendix B: Twelve Demographic Survey Questions

1. **I am (circle one):**
 - a. Female
 - b. Male

2. **My age is (fill in the blank):** _____

3. **I am a (circle one):**
 - a. Freshman
 - b. Sophomore
 - c. Junior
 - d. Senior
 - e. Other (please specify): _____

4. **My major is (circle one):**
 - a. Undecided or undeclared
 - b. Communication Sciences and Disorders
 - c. Special Education
 - d. Other (please specify): _____

5. **How long have you *worked* in a paid position with persons with disabilities?**
 - a. Never
 - b. 1 to 40 hours
 - c. 41 hours to 160 hours
 - d. More than 160 hours

6. **Regardless of whether pay was involved, how much have you *interacted with* persons with disabilities?**
 - a. Never
 - b. 1 to 40 hours
 - c. 41 hours to 160 hours
 - d. More than 160 hours

7. **Regardless of whether pay was involved, how much have you *interacted with* persons who were using an augmentative or alternative communication system similar to John's?**
 - a. Never
 - b. 1 to 40 hours
 - c. 41 hours to 160 hours
 - d. More than 160 hours

8. **How much training have you had that focused specifically on how to use communication aids for people who have problems with speech prior to participating in this study?**
 - a. None
 - b. 1 to 5 hours
 - c. 6 to 10 hours
 - d. More than 10 hours

9. **Are you fluent in speaking and understanding spoken English?**
 - a. Yes
 - b. No

10. **Is your vision typical or corrected to function within normal limits?**
 - a. Yes
 - b. No

11. **Is your hearing typical or corrected to function within normal limits?**
 - a. Yes
 - b. No

12. Which of these best describes you:

- a. I have a history of typical development
- b. I have a disability

Appendix C: Attitudes Toward Nonspeaking Persons (ATNP) Survey (Gorenflo & Gorenflo, 1991)

Base your answer on your own beliefs and behavior. Circle ONE answer for each statement.

The words "This Person" refer to John (the person in the wheelchair).

Consider only the video you just watched.

1. I would study (for a class) with this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
2. I respect this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
3. I do not feel sorry for this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
4. This person is not intelligent.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5. This person would be easy to talk to.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
6. This person is not capable of giving a short speech to a class.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
7. I would help this person with a task such as purchasing something.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
8. This person is trustworthy.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
9. This person won't make a contribution to society.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
10. This person understands what people say.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
11. This person is sociable.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
12. I do not feel any sympathy for this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
13. I would feel uncomfortable with this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
14. I would feel inhibited with this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
15. I would not trust this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
16. This type of person would not be able to complete high school.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
17. You should not expect too much from this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
18. This person is as self-confident as other people.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
19. I would help this person obtain someone's attention.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
20. I would feel anxious around this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
21. This person would be successful in a job.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
22. This type of person is mentally handicapped.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
23. This person should expect to lead a normal life.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
24. I would feel uncomfortable answering questions asked by this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
25. This person would be able to complete college.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
26. This person is independent.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
27. I feel sorry for this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
28. I would prefer not to talk with this person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
29. This person doesn't have a good social life.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

Appendix D: Twelve Original Survey Questions (OSQ) for Ease of Understanding, Willingness to Interact, Preference for AAC systems

Base your answer on your own beliefs and behavior.

Circle ONE answer for each statement.

Consider only the video you just watched.

1. In this video, I could understand all of John's messages as easily as I understand a message spoken by a typical speaking person.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
2. If I had to use an AAC system for the rest of my life, I would prefer to communicate using a method exactly like the one that John and Bridget used in this video.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
3. If a person that I spend a lot of time with needed to use an AAC system for the rest of his/her life, I would prefer for that person communicate using a method exactly like the one that John and Bridget used in this video.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
4. I did not understand about half of the conversation that John and Bridget had in this video.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
5. I really think that John would fit in well with my circle of friends.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
6. I would really like to interact in conversations with John.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
7. If I had to use an AAC system for the rest of my life, I would have no preference about what system I use.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
8. I would be willing to help John on occasion when he needs assistance with tasks that are difficult for him.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
9. If I had to use an AAC system for the rest of my life, I would prefer to use an electronic, computerized, touch screen system that would speak aloud the vocabulary I selected on its touch screen.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
10. It would be easier for me to interact with John if he communicated using an AAC system different from the one in this video.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
11. It was really easy for me to understand John's communication.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
12. I understood everything that John communicated to Bridget in this video.	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

Appendix E: Two Open-ended Survey Items

Briefly state what Bridget did differently when communicating with John in video one versus video two.

In your opinion, what impact did this difference have?

Appendix F: Procedural Fidelity Checklist

Place a + mark beside each item that was completed as specified.

Place a – by each item that was not completed or was not completed as specified.

Procedural Fidelity for NR Group 1:

1. _____ Researcher sets up video so that video is projected on a screen at a clearly visible location in room.
2. _____ Research Assistant passes out exact number of surveys to each row.
3. _____ Researcher says: please make sure that your cell phones are off and laptops are put away for this activity.
4. _____ Researcher then reads approved recruitment and consent statements.
5. _____ Researcher says: Completing the survey is entirely voluntary and will not affect your relationship with the university, the researchers, or the course instructors. Thank you for your time.
6. _____ Does anybody have a question that I can answer? (Answers questions as needed).
7. Researcher says:
 - a. _____ Please do not open your survey until I say so.
 - b. _____ Raise your hand if you still need a survey.
 - c. _____ Please watch this video.
8. _____ Researcher plays test video.
9. Researcher says:
 - a. _____ Raise your hand if you could not hear or see that video and I will help you get reseated. (Reseat and replay video, adjust volume, until all participants can see/hear video).
 - b. _____ You will now watch a video of John and Bridget having a conversation.
 - c. _____ Watch and listen carefully.
10. _____ Researcher plays the experimental video with NO REAUDITORIZATION.
11. _____ When video ends, Researcher projects slide with instructions, and reads them, that say:
 - a. _____ Open your surveys and complete pages 1, 2, and 3.
 - b. _____ Base you answer on your own independent beliefs and behavior.
 - c. _____ The words “this person” refers to John, the individual in the video with a disability who cannot speak with his own voice.
 - d. _____ Consider only the video you just watched as you answer the questions. Read the statement, then circle whether you strongly agree, agree, are undecided, disagree, or strongly disagree with each statement.

- e. _____ Stop when you reach the stop sign after page 3. Do NOT turn to the page after the stop sign.
 - f. _____ Read carefully.
12. Researcher waits until all participants are done. Researcher says:
- a. _____ Is everybody done with pages 1-3? (Waits until all are done.)
 - b. _____ Please take a moment to look back over pages 1-3 and make sure you answered all items. If you need to change an answer, erase or clearly cross out the wrong answer and mark your correct answer.
13. Researcher says:
- a. _____ OK let's watch the next video. Watch and listen carefully.
14. _____ Researcher plays the experimental video with REAUDITORIZATION
15. _____ When video is done Researcher projects slide with instructions and reads them, that say:
- a. _____ Now open your surveys and complete pages 4 and 5.
 - b. _____ Base you answer on your own independent beliefs and behavior.
 - c. _____ The words "this person" refers to John, the individual in the video with a disability who cannot speak with his own voice.
 - d. _____ Consider only the video you *just* watched as you answer the questions. Read the statement, then circle whether you strongly agree, agree, are undecided, disagree, or strongly disagree with each statement.
 - e. _____ Stop when you reach the stop sign after page 5. Do NOT turn to the page after the stop sign.
 - f. _____ Read carefully.
16. Researcher says:
- a. _____ Is everybody done with pages 4 and 5?
 - b. _____ Please take a moment to look back over pages 4 and 5 and make sure you answered all items. If you need to change an answer, erase or clearly cross out the wrong answer and mark your correct answer.
17. Researcher says:
- a. _____ OK please pass your surveys to Research Assistant.
18. Researcher says:
- a. _____ Did everybody submit their survey? (Collects any remaining surveys).

Procedural Fidelity for RN Group 2:

1. _____ Researcher sets up video so that video is projected on a screen at a clearly visible location in room.
2. _____ Research Assistant passes out exact number of surveys to each row.
3. _____ Researcher says: please make sure that your cell phones are off and laptops are put away for this activity.
4. _____ Researcher then reads approved recruitment and consent statements.

5. _____ Researcher says: Completing the survey is entirely voluntary and will not affect your relationship with the university, the researchers, or the course instructors. Thank you for your time.
6. _____ Does anybody have a question that I can answer? (Answers questions as needed).
7. Researcher says:
 - a. _____ Please do not open your survey until I say so.
 - b. _____ Raise your hand if you still need a survey.
 - c. _____ Please watch this video.
8. _____ Researcher plays test video.
9. Researcher says:
 - a. _____ Raise your hand if you could not hear or see that video and I will help you get reseated. (Reseat and replay video, adjust volume, until all participants can see/hear video).
 - b. _____ You will now watch a video of John and Bridget having a conversation.
 - c. _____ Watch and listen carefully.
10. _____ Researcher plays the experimental video with REAUDITORIZATION.
11. _____ When video ends, Researcher projects slide with instructions, and reads them, that say:
 - a. _____ Open your surveys and complete pages 1, 2, and 3.
 - b. _____ Base you answer on your own independent beliefs and behavior.
 - c. _____ The words “this person” refers to John, the individual in the video with a disability who cannot speak with his own voice.
 - d. _____ Consider only the video you just watched as you answer the questions. Read the statement, then circle whether you strongly agree, agree, are undecided, disagree, or strongly disagree with each statement.
 - e. _____ Stop when you reach the stop sign after page 3. Do NOT turn to the page after the stop sign.
 - f. _____ Read carefully.
12. Researcher waits until all participants are done. Researcher says:
 - a. _____ Is everybody done with pages 1-3? (Waits until all are done.)
 - b. _____ Please take a moment to look back over pages 1-3 and make sure you answered all items. If you need to change an answer, erase or clearly cross out the wrong answer and mark your correct answer.
13. Researcher says:
 - a. _____ OK let’s watch the next video. Watch and listen carefully.
14. _____ Researcher plays the experimental video with NO REAUDITORIZATION
15. _____ When video is done Researcher projects slide with instructions and reads them, that say:
 - a. _____ Now open your surveys and complete pages 4 and 5.
 - b. _____ Base you answer on your own independent beliefs and behavior.

- c. _____ The words “this person” refers to John, the individual in the video with a disability who cannot speak with his own voice.
 - d. _____ Consider only the video you *just* watched as you answer the questions. Read the statement, then circle whether you strongly agree, agree, are undecided, disagree, or strongly disagree with each statement.
 - e. _____ Stop when you reach the stop sign after page 5. Do NOT turn to the page after the stop sign.
 - f. _____ Read carefully.
16. Researcher says:
- a. _____ Is everybody done with pages 4 and 5?
 - b. _____ Please take a moment to look back over pages 4 and 5 and make sure you answered all items. If you need to change an answer, erase or clearly cross out the wrong answer and mark your correct answer.
17. Researcher says:
- a. _____ OK please pass your surveys to Research Assistant.
18. Researcher says:
- a. _____ Did everybody submit their survey? (Collects any remaining surveys).

End Note

- ¹ Crown XLS 202 amplifier is a product of the HARMAN Professional Audio Company, Northridge, CA.
- ² Electro-Voice Sx80 speakers are a product of Bosch Communication Systems, Burnsville, MN.
- ³ Audio Technica ATW 3131 microphone is a product of Audio-Technica US., Inc., Stow, OH.
- ⁴ Shure SM262 microphone mixer is a product of Shure Corporation, Niles, IL.
- ⁵ Epson 915W projector is a product of Epson, Long Beach, CA.
- ⁶ Creston MP2E eight button controller and audio processor is a product of Creston, Rockleigh, NJ.
- ⁷ The Apple MacBook Air and iMovie are products of Apple Inc., Cupertino, CA.
- ⁸ Excel is a product of Microsoft, Redmond, WA.