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University American Sign Language (ASL) Second Language Learners: Receptive and Expressive ASL Performance

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University American Sign Language (ASL) second language learners: How do they perform receptively and expressively after a year of ASL instruction?

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ABSTRACT

American Sign Language (ASL) is used by estimates of up to 500,000 people (deaf and hearing) in the United States (Mitchell et al., 2006); however, the majority of users are typically hearing university students, frequently within university interpreting or deaf education preparation programs, who learn ASL as a second language (L2). It is unclear how these learners develop their skills as they progress through university training programs. The present study documents university learners' receptive and expressive ASL skills, factors related to performance, and self-evaluation and strategy use at the end of their ASL IV course. Both assessments are readily available, efficient to administer and score, and provide immediate feedback to learners. Self-reported years of ASL experience, hours of academic ASL use, fluency, and university major related to scores on an expressive handshape phonological fluency task as measured by correlations and ANOVAs. Based on student performance, implications for university instructors of L2 ASL learners are discussed.

INTRODUCTION

The vast majority of educational interpreters and teachers of the deaf who serve deaf and hard of hearing students in the K-12 setting are females who learn American Sign Language (ASL) as adults within university programs (Krause, Kegl, & Schick, 2008; Stauffer, 2011; Storey & Jamieson, 2004; but see overview of program that required ASL fluency at program entry; Humphries & Allen, 2008). These learners are referred to as second modality-second language (M2L2) learners, meaning that they learn a second language that utilizes a different mode than their first language; in this case ASL, which is conveyed visually, as opposed to their first language of spoken English (Chen Pichler, 2009b, 2011; Chen Pichler & Koulidobrova, 2015). This difference in modality between first spoken languages and second visual languages may influence their receptive and expressive ASL accuracy (Chen Pichler, 2011; Chen Pichler & Koulidobrova, 2015; Mayer & Akatamasu, 2000; Mayer & Wells, 1996; Rosen, 2004), as "…differences in modality do not allow direct phonological transfers of a phonological category in a spoken language to a signed language" (Ortega & Morgan, 2010, p. 70). While most university interpreter and teacher of the deaf preparation programs require a series of ASL courses (e.g., Beal-Alvarez & Scheetz, 2015; Swaney & Smith, 2017), it is unclear how M2L2 learners develop their ASL skills across university preparation programs.

The purpose of the present study was to investigate M2L2 university learners' ASL skills using two readily available receptive and expressive ASL assessments and identify areas in need of targeted instruction. First, I review characteristics of M2L2 learners and assessments, and outcomes used previously with M2L2 learners. Then I review the assessments, procedures, and results for the present investigation, including factors related to learner performance (i.e., age, years of sign language experience, program major, self-reported hours using ASL, and self-reported ASL fluency), self-rating, and strategy use. Finally, I address implications for instruction within university interpreter and teacher of the deaf preparation programs.

M2L2 LEARNERS

ASL is a natural language with its own structure and grammar that differs significantly from English (see Neidle, Kegl, MacLaughlin, Bahan, & Lee, 2000). Signs in ASL are composed of five phonological parameters: handshape (the number of fingers extended/retracted), palm orientation (the direction in which the palm faces), location (where the handshape is produced on the body or in space), movement (how the handshape moves or remains in the same location), and non-manual markers (i.e., eyes, eyebrows, mouth, head tilt, etc.; Neidle, Kegl, MacLaughlin, Bahan, & Lee, 2000). Most M2L2 ASL learners are typically hearing females who attended interpreter or teacher of the deaf training programs with little ASL knowledge before university courses (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussel, McAllister, & Listman, 2018; Dodd & Scheetz, 2003; Krause, Kegl, & Schick, 2008; Schick, Williams, & Bolster, 1999; Schick, Williams, & Kupermintz, 2006; Stauffer, 2011; Storey & Jamieson, 2004; Thoryk, 2010; Yarger, 2001). Some published studies across various signed languages investigated skills of working interpreters with at least a few years of interpreting experience (Bontempo & Napier, 2007; Krause, Kegl, & Schick, 2008; Schick, Williams, & Kupermintz, 2006; Storey & Jamieson, 2004; Yarger, 2001). Other studies report the performance of naïve signers (Chen Pichler, 2009a, 2011; Hildebrandt & Corina, 2002; Ortega & Morgan, 2010; Stungis, 1981; Poizner, 1983; Poizner & Lane, 1978) or university students in the process of acquiring sign language (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussel, McAllister, & Listman, 2018; Bailey, 2013; Bochner, Christie, Hauser, & Searls, 2011; Bochner et al., 2016; Schlehofer & Tyler, 2016; Stauffer, 2011; Williams & Newman, 2016). Within this article I focus on the ASL skills of M2L2 university learners.

While on the surface these M2L2 learners appear similar, their ASL skills are affected by their age at first exposure to ASL, the amount and type of ASL exposure, the environment in which they learned ASL (e.g., formal or informal), their reasons for learning ASL, their knowledge of a different (i.e., non-ASL) second language, the ability to apply L1 transfer correctly (i.e., positive or negative) when learning ASL as an L2, and complexity of the ASL task used to measure their skills, although available research does not comprehensively review the backgrounds of participants (Bochner et al., 2016; Kemp, 1998; McKee & McKee, 1992; Supalla, Hauser, & Bavelier, 2014). Storey and Jamieson (2004) reported that 70% of interpreters in their sample of survey respondents learned ASL as adults, while 21% learned as adolescents, which reflects an increasing trend in M2L2 learners who have ASL experience through ASL as a foreign language in high school (Rosen, 2004; Wilcox & Wilcox, 1991). University students in five university interpreter preparation programs who were beginners (i.e., ASL I students) reported a mean of about two years' experience with ASL while advanced (i.e., ASL III and ASL IV) reported a mean of about nine years (Stauffer, 2011). Jacobs (1996) posited that ASL learners whose first language is English need about 1320 hours of instruction to "satisfy routine social demands and limited work requirements" (Kemp, 1998, p. 256). That equals 55 days of non-stop signing 24 hours per day.

Previous researchers have addressed possible theories that support learning a second language, in this case the visual language of ASL, when one's first language is auditory-based spoken English. While ASL and English may share some underlying cognitive and linguistic aspects, transfer of these aspects from one language to another, following Cummins' Linguistic Interdependence Hypothesis (Cummins, 1984, 2000) may be limited when languages differ in modality (Mayer & Akatamasu, 2000; Mayer & Wells, 1996; Williams & Newman, 2016). Rosen (2004) proposed a Cognitive Phonology Model to account for production errors of M2L2 learners across ASL parameters, such that learners' perception of signs (receptive comprehension) and poor motor dexterity contribute to their errors within ASL production. Rosen provided a detailed analysis of these types of learner errors, although Chen Pichler (2011) noted that it is unclear the extent to which faulty learner perception affects production. Hilger, Loucks, Quinto-Pozos, and Dye (2015) demonstrated that most hearing M2L2 ASL learners' motor systems for sign language articulation were immature compared to Deaf native signers using motion capture technology and repeated sign language utterances. While ASL learners exhibit differences across the perception to production continuum, they tend to struggle with aspects of both comprehension and production (see Ferrara & Nilsson, 2017, for a review of M2L2 learners related to other signed languages). Additional assessment of M2L2 learners' skills with readily available assessments is needed to guide effective ASL instruction.

ASL INSTRUCTION AND ASSESSMENTS

Few sign language assessments in general, and ASL assessments in particular, are readily available to assess signers' expressive and receptive ASL abilities (see Enns et al., 2017, for a review), and even fewer for college aged M2L2 learners. Most university interpreter and teacher of the deaf preparation programs address ASL instruction through a sequence of ASL courses that embed similar curricula, such as *Signing Naturally* (Smith, Lentz, & Mikos, 2008), with in-class activities and participation in community events where ASL is used (Beal-Alvarez & Scheetz, 2015; Rosen, 2014; Swaney & Smith, 2017). Additionally, sign language learners across ASL and Auslan sign language courses reported establishing spaces to use sign language with their classmates and taking advantage of online resources and sign language labs on campus to further their skills (Storey & Jamieson, 2004; Rosen, 2014; Willoughby & Sells, 2019).

To assess university learners' ASL skills, many university programs use an external proficiency interview such as the Sign Language Proficiency Interview (SLPI; Newell, Caccamise, Boardman, & Holcomb, 1983) or the American Sign Language Proficiency Interview (ASLPI; Gallaudet University, 2014) (Beal-Alvarez & Scheetz, 2015). These assessments involve an interview conducted between a native deaf signer and the person being assessed. Scores are determined by rating teams and provided to candidates some weeks after the interview. The SLPI uses a scale of 11 options from *no functional skills* to *superior plus* (Newell & Caccamise, 2007). The ASLPI uses a scale of 0 (*no functional language ability*) to 5 (*communicate in ASL with accuracy and fluency*). Finally, the Educational Interpreter Performance Assessment (EIPA; Boys Town National Research Hospital, 2018), is an option to assess the interpreting skills of educational interpreters, during which candidates sign and voice academic content for a K-12 student with ASL as one testing format option. Performance is rated by teams of three, including a deaf rater. The majority of educational interpreters score at *intermediate* or below (Schick, Williams, & Bolster, 1999; Yarger, 2001). These external assessments charge candidates for testing administration, involve some degree of rater subjectivity (Bochner et al., 2016; Wang, Napier, Goswell, & Carmichael, 2015) and require weeks for results, which does not lead to immediate changes in learner-focused instruction. Based on results from these interviews, most M2L2 ASL learners graduate from university with basic or conversational ASL skills and require ongoing professional development to advance their ASL skills (Curle & Jamieson, 2011; Schick, Williams, & Bolster, 1999; Yarger, 2001).

RECEPTIVE ASSESSMENTS

Aside from external conversational assessments, few assessments are available to efficiently document and score ASL learners' skills across their preparation programs. Most receptive assessments were developed as research tools and investigated effects of learning ASL as a deaf native signer, a deaf non-native signer, a hearing sign-naïve participant, and/or a hearing learner of ASL as an L2. Assessments addressed the facilitative and inhibitory effects of sign language priming tasks (Carreiras, Gutiérrez-Sigut, Baquero, & Corina, 2008; Hildebrandt & Corina, 2002; Corina & Emmorey, 1993; Mayberry & Witcher, 2005) similarity and discrimination judgments (Bailey, 2003; Baus, Gutiérrez-Sigut, Quer, & Carreiras, 2008; Bochner, Christie, Hauser, & Searls, 2011; Bochner et al., 2016; Hildebrandt & Corina, 2002; Morford & Carlson, 2011; Morford, Grieve-Smith, MacFarlane, Staley, & Waters, 2008; Poizner & Lane, 1978; Stungis, 1981; Williams & Newman, 2016), and recombination of sign parameters to form new signs (Corina & Emmorey, 1993; Corina, Hafer, & Welch, 2014) related to American, British, Catalan, and Spanish Sign Languages. Three receptive assessments, reviewed below, remain in varied stages of availability (and were unavailable at the time of the present data collection; also see Singleton & Supalla, 2011, and Enns et al., 2017 for a review of ASL assessments).

In general, it appears native and non-native signers exhibit differences in how they process signs at the parameter level (Bochner, Christie, Hauser, & Searls, 2011; Bochner et al., 2016; Carreiras et al., 2008; Corina, Hafer, & Welch, 2014; Hildebrandt & Corina, 2002; Mayberry & Witcher, 2005; Morford, Grieve-Smith, MacFarlane, Staley, & Waters, 2008), with hearing ASL L2 learners attending to "phonetic detail that native signers have learned to ignore" (Morford, Grieve-Smith, MacFarlane, Staley, & Waters, 2008, p. 607). Based on results of ASL phonology investigations, location is hypothesized to be identified first within a sign but seems to inhibit lexical retrieval even though it has fewer competitors than handshape and movement (i.e., the number of different sign locations is significantly fewer than the number of different handshapes and movements). Mirus, Rathmann, and Meier (2001) reported M2L2 errors in location when producing isolated ASL signs, such as sign placement at the torso, shoulder, or elbow in place of the forearm and wrist. Handshape is a complex parameter due to the number of involved components (i.e., selected fingers, amount of splay or aduction, etc.; Caselli & Cohen-Goldberg, 2014) and a larger set of signs with similar handshapes (Williams & Newman, 2016). Handshape has facilitatory effects for lexical access and retrieval in some tasks and appears to be more salient for non-native signers than native signers (Carreiras, Gutiérrez-Sigut, Baquero, & Corina, 2008). Marked handshapes (i.e., less frequently occurring, less easily perceived, more difficult to articulate with the hand; e.g., R, W) appear more difficult for non-signers to produce than unmarked handshapes (i.e., more frequently occurring handshapes; e.g., 5, 1) (Chen Pichler, 2009b, 2011).

Movement appears to have little effect on lexical access and retrieval, but paired with location, creates the syntactic "skeletal structure" of ASL (Hildebrandt & Corina, 2002, p. 607) (see Caselli & Cohen-Goldberg, 2014, for a more in-depth review). Bailey (2013) found that handshape and movement proved the most difficult for university M2L2 learners to accurately produce within familiar ASL I and II vocabulary and that handshape accuracy increased with ASL experience. However, in Schlehofer and Tyler's (2016) ASL sentence reproduction task, M2L2 learners had the least difficulty with handshape production after seeing it, followed by location and palm orientation, while movement proved challenging (Schlehofer & Tyler, 2016). Bailey suggested a possible order of parameter acquisition for adult L2 learners: location, orientation, movement, handshape, and non-manual markers, and suggested a need for parameter assessments and explicit instruction in the five parameters of ASL signs. Bochner and colleagues (2011) noted that "students must learn to detect contrastive differences and overlook noncontrastive differences in the course of acquiring linguistic knowledge" (p. 1321).

Three receptive ASL assessments have been developed and used with deaf and hearing signers. The ASL-Discrimination Test (ASL-DT) was developed to measure adult signers' abilities to determine if two sequential ASL statements, presented in video form, are similar or different based on changes in phonology (Bochner, Christie, Hauser, & Searls, 2011). Bochner and colleagues (2011) administered the 48-item ASL-DT to a group of 127 typically hearing ASL learners in beginning (i.e., ASL I, II, and III, n = 111) and intermediate (i.e., ASL V, n = 16) university ASL courses (no other information included). They reported a significant difference in performance between beginning signers and both intermediate and native signers but no difference between intermediate and native signers. When compared to participant rating levels for the SLPI, Bochner and colleagues (2016) reported that the ASL-DT accurately discriminated among three proficiency levels for adult ASL learners (i.e., *high*, *intermediate*, and *low*). Results do not provide analysis of areas for immediate learner feedback and no published data are currently available for score comparison.

The ASL Comprehension Test (ASL-CT; Hauser et al., 2016) is a multiple-choice assessment that evaluates learners' "knowledge of linguistic structures associated with depiction (e.g., classifier constructions, role shift, use of signing space)" (Hauser et al., 2016, p. 68). Items and responses were composed of videos of someone signing, of an activity, or of a line drawing. A group of 20 M2L2 ASL university students in ASL I-VI courses at Rochester Institute of Technology (no additional data on students) had a mean score of 63% and their ASL-CT performance significantly correlated their self-reported ASL course level (r = .726). Hauser and colleagues reported internal reliability (α = 0.834), concurrent reliability with the ASL-Sentence Reproduction Test, and discriminant validity based on native versus non-native signer performance.

Finally, Supalla, Hauser, and Bavelier (2014) developed the ASL-Sentence Reproduction Task (ASL-SRT) "with the goal of establishing a standardized instrument that could be used across age and ability level to assess proficiency and fluency of signers" (p. 859). During this task, participants watch and reproduce, verbatim, 20 ASL sentences that increase in difficulty (length, number of propositions, and morphological complexity) and their responses are video-recorded and scored by trained evaluators as accurate or inaccurate. Supalla and colleagues (2014) administered this assessment to 75 deaf and hearing adults, all of whom were native ASL signers.

They concluded that the ASL-SRT distinguishes among ASL fluency level as evidenced by overall score and types of errors within reproductions. Deaf (M = 14.7, SD = 2.8) scored higher than hearing adults (M = 9.4, SD = 4.3). Five trained native signers achieved inter-rater agreement correlations from 0.86 to 0.92 (Hasuer et al., 2008, provides validity data on a previous version of the ASL-RST). However, at the time of the present study data did not include non-native hearing signers and this assessment was not available.

The *ASL-Receptive Skills Test* (ASL-RST; Enns, Zimmer, Boudreault, Rabu, & Broszeit, 2013) is one readily available assessment developed for native or near-native ASL signers between 3 and 13 years of age. It includes 42 video-recorded ASL items across nine grammatical categories (i.e., number-distribution, negation, noun-verb, spatial verbs (location and action), size-and-shape-specifier classifiers, handle classifiers, role shift, and conditionals) and items increase in difficulty as the assessment progresses. The ASL-RST showed internal consistency (r = .88 for marginal maximum likelihood reliability) for the standardization sample of 203 deaf children. The ASL-RST has been used with 21 adult M2L2 learners who used ASL beyond the classroom setting for a minimum of three years, who scored an average of 80% correct (range 64-95%), and whose scores significantly correlated with an expressive ASL vocabulary picture naming task (r = 0.45) (Lieberman, Borovsky, Hatrak, & Mayberry, 2014). It also was administered to 20 deaf adult late ASL learners (i.e., first exposed to ASL between 5-14 years of age), who scored an average of 86% (range 56-100%) (Lieberman, Borovsky, Hatrak, & Mayberry, 2014); and 96 deaf students who were late learners of ASL aged 18-22 years and who attended a residential school for the deaf (M = 77%, range = 69-82%) (Beal-Alvarez, 2016). Across samples, results showed that some late-learning deaf and hearing participants beyond the intended age range for the assessment scored near ceiling, but none achieved ceiling scores (Beal-Alvarez, 2014, 2016; Lieberman, Borovsky, Hatrak, & Mayberry, 2014). In sum, the ASL-RST was the only available ASL receptive assessment that had published data for M2L2 ASL learners.

Expressive assessments

Even fewer expressive ASL assessments are available (see Enns et al., 2017 for a review). Tasks used previously for elicitation of expressive sign language skills with adults involved production of narratives given picture or cartoon stimuli (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussel, McAllister, & Listman, 2018; Taub Galvin, Pinar, & Mather, 2008), repetition of signed stimuli (Bailey, 2013; Chen Pichler, 2009b, 2011; Ortega & Morgan, 2010, 2015; Schlehofer & Tyler, 2016; Supalla, Hauser, & Bavelier, 2014; Williams & Newman, 2016), gating tasks in which participants identify a sign revealed in subsequent frames (Emmorey & Corina, 1993; Morford & Carlson, 2011) and sign production given target handshapes (Beal & Faniel, 2018; Morere, Witkin, & Murphy, 2012). Related to a narrative retell of a picture book in ASL, M2L2 university learners at the end of their ASL IV course, the majority of whom were interpreting majors with 1-2 years of ASL experience, struggled with producing constructs that create visual representations of narrative action, such as classifiers/depicting contructs and constructed action (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussell, McAllister, & Listman, 2018), that deaf signing adults frequently use within narrative renditions (Beal-Alvarez & Trussell, 2015; Taub, Galvin, Pinar, & Mather, 2008). Use of narrative tasks often requires extensive time to train coders and analyze data (see Morgan, 2005, for a review), prohibiting immediate feedback to learners. One production task that is efficient to administer and score is the 51U handshape task.

The 51U task (Morere, Witkin, & Murphy, 2012) was developed specifically to parallel the FAS task for spoken English, in which participants produce as many words as they can within one minute that begin with each of the three letters F, A, and S (Tombaugh, Kozak, & Rees, 1999). The 51U task was designed to measure "sign-based phonemic fluency" (Morere, Witkin, & Murphy, 2012, p. 144) and depth of ASL lexical knowledge. Participants produce as many signs as they can for each of three target handshapes within one minute per handshape. Overall score is calculated by the sum of accurate signs the participant produces across the three handshapes. A group of 48 deaf Gallaudet University students had a mean total of 35.0 signs (SD = 9.9, range 15-57). Morere and colleagues (2012) reported moderate to high correlations between deaf students' 51U scores and a measure of ASL vocabulary recall (Morere-Signed Verbal Learning Test (MSVLT); Morere, Frugé, & Rehkemper, 1992), in which students received and recalled a list of categorical items in ASL, reflecting a "strong relation between ASL reception and recall skills and the ability to use handshape-based information to perform the linguistic search and retrieval processes involved in the 51U" (Morere, Witkin, & Murphy, 2012, p. 150).

Beal and Faniel (2018) administered the 51U task to 55 M2L2 university learners at the end of their ASL IV course. The majority were females 21-24 years of age, interpreting majors, self-rated their ASL skills as conversational, and had been signing one year, meaning they learned ASL in university courses. A small minority reported more than three years of ASL skill, reflecting ASL courses in high school. Their group mean score on the 51U was 28 signs (SD = 9.0, range 17-47), which was similar to the mean of 24 signs for a group of 12 deaf high-school students aged 19-21 who attended a residential school for the deaf and had hearing parents (SD = 9.2, range not reported; Beal-Alvarez & Figueroa, 2016). Interpreting majors and those with more years of self-reported ASL experience produced more signs (Beal & Faniel, 2018). Additionally, between the end of ASL IV and one year later, a subgroup of 16 participants increased their mean score by 5 items, showing growth within this task given additional ASL experience. While the 51U task does not have published reliability or validity, previous data coders achieved high inter-observer agreement (80% or higher) and disagreements were easily resolved by jointly watching learners' videos (Beal & Faniel, 2018).

SELF-RATING OF ASL SKILLS

The myriad of factors that affect ASL learners' skills includes metacognition, which is an awareness and monitoring of one's own learning processes and abilities (Merriam-Webster, 2018), and may lead to changes in performance when paired with experience. Self-evaluation is widely used at the university level (Falchikov & Boud, 1989; Stauffer, 2011). In general students' self- and instructor ratings appear to moderately correlate and students in more advanced courses more accurately self-assess (Falchikov & Boud, 1989). Research is scarce related to self-evaluation of ASL skills; a few studies demonstrate learner awareness of both their own skills and the skills required for their job. For example, experienced interpreters in Australia were aware of the gap between needed skills and their own self-rated competencies for those skills (Bontempo & Napier, 2007). A group of 33 educational interpreters in Canada with a mean of 8 years of experience (range 6 months to 25 years) self-reported a weekly average of seven unknown words while interpreting, demonstrating both an awareness of what they did not know and the need for continuous learning related to ASL even after several years of interpreting experience (Storey & Jamieson, 2004). Of note, 23 learned ASL as adults, seven learned it in adolescence, and three as children; only one third of the sample completed an interpreter training program; and only 12% had interpreter certification (Storey & Jamieson, 2004). Finally, a sample of 110 teachers of the deaf with 2-30 years of experience indicated additional receptive and expressive ASL training was needed in their current teaching positions (Dodd & Scheetz, 2003).

A few studies present self-evaluation skills related to ASL learners both within specific tasks and in general. Beal and Faniel (2018) compared M2L2 university students' self- and instructor ratings on a picture book narrative task rendered in ASL using a rubric with 13 indicators and five proficiency levels across each indicator at the end of ASL I and the end of ASL IV a year later. Students were 20-29 years of age, interpreter and deaf education majors, and had 1-2 years of ASL experience at the end of ASL I. Students overestimated their ASL skills compared to instructor ratings at the end of ASL I, student and instructor ratings had higher agreement at the end of ASL IV, and students' self-ratings increased and correlated across time (r = .517), suggesting they were more aware of their ASL skills as they progressed through ASL courses.

However, Stauffer (2011) reported decreased accuracy in self-rating as students progressed from beginner to advanced ASL courses. She investigated 156 university beginning (N = 90, ASL I) and 66 advanced (ASL III and IV) ASL learners' abilities to self-assess their skill level using the 11 categories of the SLPI (Newell, Caccamise, Boardman, & Holcomb, 1983) and compared student self-ratings to instructor ratings. Learners attended ASL classes across five university professors and ten instructors (five deaf and five hearing). Stauffer reported that beginners' self-rated mean was *novice plus* and the advanced students' self-rated mean was *intermediate*; instructors' ratings for the candidates were *survival* and *intermediate*, respectively. Learners' and instructors' ratings moderately correlated overall (r = .62) and the correlation between beginner scores was larger (r = .44) than advanced learners (r = .37), which differs from reports of increased agreement with more advanced courses. Expressively, learners' scores on the narrative task (Beal, Scheetz, Trussell, McAllister, & Listman, 2018), the 51U production task (Beal & Faniel, 2018), and the sentence reproduction task (Schlehofer & Tyler, 2016) increased with their self-rated proficiency levels (i.e., *basic, conversational,* and *fluent*; and *beginner, intermediate,* and *advanced*, respectively).

Metacognition may lead to awareness of strategy use within ASL tasks. When producing signs related to specific handshapes within the 51U task, M2L2 learners were aware of and reported their use of strategies when asked, including activating familiar vocabulary (45%), moving the target handshape to different locations (30%), or using different movements (8%) to produce additional signs (Beal & Faniel, 2018). Finally, within a sentence reproduction task, Schlehofer and Tyler (2016) noted that in a few instances M2L2 learners were aware of their production errors and self-corrected.

However, sign language learners may need instruction in how to accurately self-evaluate their sign language skills (Bontempo & Napier, 2007; Nicodemus & Emmorey, 2015; Stauffer, 2011), as suggested by Stauffer (2011) when more advanced ASL learners' self-evaluation accuracy decreased compared to instructors. A false belief in the simplicity of learning ASL, the option to default to fingerspelling and transcoding (i.e., ASL signs in English word order), lack of full visual access to self-produced signs and non-manual markers (i.e., signers view the backs of their hands) and weaknesses in their self-monitoring skills may distort learners' perceptions of their skills (Kemp, 1998; Nicodemus & Emmorey, 2015) and lead to overestimation of those skills (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussell, McAllister, & Listman, 2018; Lang, Foster, Gustina, Mowl, & Liu, 1996; McDermid, 2009; Nicodemus & Emmorey, 2015; Schick, Williams, & Bolster, 1999; Stauffer, 2011; Yarger, 2001). Accurate awareness of one's receptive and expressive ASL skills through assessment scores and self-evaluation can assist learners and instructors in identifying areas for improvement, especially as learners progress through sequential ASL courses, as opposed to only an external evaluation at completion of one's program.

Purpose

Few assessments are readily available to document university M2L2 ASL learners' skills and highlight areas in need of instruction before learners graduate interpreter and teacher of the deaf preparation programs. The present study had four aims: 1) document M2L2 ASL learners' receptive and expressive ASL skills at the end of ASL IV; 2) investigate factors related to their performance on each task (i.e., age, years of sign language experience, program major, self-reported hours using ASL, and self-reported ASL fluency); 3) document M2L2 ASL learners' self-rating accuracy; and 4) identify areas in need of targeted ASL instruction for learners in university interpreter and teacher of the deaf preparation programs.

Methods

Participants

A total of 86 typically hearing university learners (82 females, 4 males) participated in data collection at the end of their ASL IV course. ASL IV is the last in a sequence of four ASL courses required of interpreting, deaf education, and deaf studies candidates: ASL I and II are taught in daily 2.5 hour sessions during the months of June and July, respectively, and ASL III and IV are taught across fall and spring semesters, respectively, using the *Signing Naturally* curriculum (Smith, Lentz, & Mikos, 2008) and supplemental materials. Students are encouraged to attend community ASL events, such as silent dinners and coffee chats where ASL is the language of communication, across their ASL courses. All ASL courses at the university are taught in a synchronous hybrid format, in which the majority of students are face-to-face in the classroom and a small number of distance students join the face-to-face class simultaneously through online video technology. All of the instruction and content is exactly the same for all learners. For the present study each participant completed an IRB-approved consent and background form. Spoken English was the home and preferred language for all participants. Participants responded to the prompt *I consider my signing skills to be:* fluent, conversational, basic, in need of remediation). The majority of participants were interpreting majors, 24 years of age or younger, with self-rated *conversational* ASL skills, who had been signing for about a year (see Table 1; see Beal-Alvarez & Scheetz, 2015, for an overview of the university programs). Twenty-three had been signing for more than three years; only six of these had deaf family members while the rest learned sign language as the result of a deaf friend or because they took ASL classes in high school.

ASL-RST

The focus of this study was readily available, efficient to administer and score ASL assessments that could supplement external ASL assessments and provide immediate feedback to learners and instructors. The ASL-RST (Enns et al., 2013) was the only available receptive ASL measure at the time of data collection and has published performance data for comparison. It requires 12 minutes to administer and was easily adaptable to group administration with digital responses. Traditionally the ASL-RST is administered one-on-one with a paper response form that the assessor completes during test administration. Participants watch the continuously running video, which presents 2-3 second video clips of ASL, each followed by four picture responses to which participants point. The assessor circles the corresponding response on a paper answer sheet in real-time.

Table 1. M2L2 ASL learner demographics for the 51U and ASL-RST assessments.

	51U	ASL-RST
Total N	86	33
18-20 years	25	13
21-24 years	43	8
25-28 years	9	6
29+ years	9	6
Female	82	31
Male	4	2
Deaf Ed	16	8
Interpreting	57	17
Deaf Studies	11	8
Other	2	0
Basic	15	10
Conversational	67	22
Fluent	4	1
Signing 1 year	50	20
Signing 2 years	14	6
Signing 3+ years	23	7

Administration of the ASL-RST was modified in the present study. All participants watched the assessment video as a group. Then they responded individually by selecting one of four number choices for each test item on a digital Google Form accessed by their personal technology devices (Smart phone or iPad). This modified response format allowed one group assessment session that simultaneously included online students and face-to-face students within the ASL IV class and recorded their responses in a downloadable online format.

Additionally, to document participants' self-ratings and metacognition about their performance on the assessment, they answered questions on the Google Form related to how they thought they performed (i.e., 91-100%, 81-90%, etc.) and what was easy and hard for them about the assessment. All ASL-RST responses were downloaded to an Excel sheet for data analysis. I calculated overall raw scores (out of 42 items), grammatical category scores, and 'hard' and 'easy' responses by theme. I investigated relations between ASL-RST scores and participant factors (i.e., age, years of signing experience, major, self-reported hours of ASL use in academic and social settings, and self-reported ASL fluency) using correlations and ANOVAs. I did not analyze gender because there were only four males. Thirty-three participants completed the ASL-RST.

51U TASK

The 51U was administered individually in quiet areas of the university library. The three handshapes were administered in the same order to each participant. A trained research assistant or I (i.e., senior student in the interpreting program) explained the directions in spoken English (to ensure participant comprehension of task procedures) and video-recorded each participant for each handshape. At the end of the U handshape participants were asked what strategies they used to produce signs within the task and their responses were video recorded. Signs were transcribed, coded as right/wrong (i.e., one point each correct production), and correct responses were summed for each handshape and across the three handshapes for a total production score. Accurate signs were defined as signs that used the correct target handshape (i.e., 5, 1, U) on the dominant hand.

For the 5 handshape, signs that used number incorporation were included as correct (e.g., 5-DAYS, 5-MINUTES, etc.) and for the 1 handshape pointing signs (e.g., EYE, EAR, etc.) were included per discussion with Donna Morere, assessment developer (D. Morere, personal communication, November 11, 2018). This differs from the MacArthur Communicative Development Inventory for American Sign Language checklist (Anderson & Reilly, 2002), which does not include pointing responses to body parts. Additionally, proper nouns, such as AMERICA and HAWAII (but not individual name signs) were counted as accurate, in contrast with Morere et al. (2012).

While Morere and colleagues (2012) presented only total scores across the three handshapes, I investigated total items produced by handshape as a comparison with previous studies of deaf students (Beal-Alvarez & Figueroa, 2016) and M2L2 learners (Beal & Faniel, 2018). I also used correlations, one-way Analysis of Variance (ANOVA), and effect sizes to determine if the following factors related to participant performance: age, years of signing experience, major, self-reported hours of ASL use in academic and social settings, and self-reported ASL fluency. Finally, I investigated strategy use during the 51U task by transcribing participants' strategy responses, placing them into common themes, and completing a frequency count of each theme, similar to previous procedures (Beal & Faniel, 2018).

As a means of comparison, 9 deaf adults (4 females, 5 males) also completed the 51U task, as deaf signing adults are language models for deaf signing children (Beal-Alvarez & Trussell, 2015; Berke, 2013). All deaf adults were staff at a residential school for the deaf where the bilingual philosophy included ASL as the language of instruction and communication. Based on self-report, all had hearing parents and a variety of home languages as children (e.g., spoken English, signed English, ASL). Six learned ASL before the age of 4 years; three learned ASL as adults (i.e., 18-21 years of age). The vast majority attended local schools, as opposed to schools for the deaf, across their K-12 educations.

INTER-OBSERVER AGREEMENT

I coded all participant videos and have an Advanced rating on the SLPI and 18 years of experience using ASL within instruction and conversation. The second rater, a graduate student with 10 years of experience using ASL and an Advanced rating on the SLPI, independently coded 21 (24%) of participant videos. Agreement was 80% across videos, meaning that both raters independently agreed on each produced item across each handshape 80% of the time. Similar to other studies (e.g., Ortega & Morgan, 2015; Beal & Faniel, 2018), all disagreements were discussed and resolved to 100% agreement.

RESULTS

I present ASL-RST results and self-evaluations, followed by 51U results and strategies, and factors related to receptive and expressive performance on the two tasks.

ASL-RST

No participant scored at ceiling for the ASL-RST at the end of ASL IV. The mean score of the 33 participants was 30.9 items correct out of 42 items (73.5%, SD = 4.13 items) with a range of 19-37 correct items (45-88%). Participants' mean correct score was highest for Conditionals (90%), followed by Negation and Spatial Verbs Action (82% each), Noun-Verb (81%), Handling Classifiers (75%), Number/Distribution (69%), Size and Shape Classifiers (68%), Spatial Verbs Location (60%), and Role Shift (52%). Some items appeared easier for students than others, such that 11 items were above 90% accurate across participants and another 11 items were above 80% accurate; these items were negation (n = 7 items), spatial verb action (n = 3 items) or location (n = 2 items). However, 8 items were below 60% accuracy, and these included spatial verb location (n = 4 items), number distribution (n = 3 items), and negation (2 items). Participant performance decreased as item number increased, demonstrating that they were sensitive to an increase in item difficulty. No investigated factors related to ASL-RST performance: Age (F [3, 29] = 1.98, p = .140, η^2 = .170, or partial Eta squared, measures the proportion of variance accounted for by a given variable), years of signing experience (F [2, 30] = 1.69, p = .201, η^2 = .101), major (F [2, 30] = .375, p = .690, η^2 = .024), self-reported hours using ASL (r = -.076, p = .673), or self-reported fluency rating (F [1, 31] = 1.53, p = .225, η^2 = .047).

Related to ASL-RST self-rated performance, the majority (n = 19; 61%) judged themselves scoring at 80% or higher; only eight actually did so (and none scored above 90%). The majority of participants scored between 71-80% correct (N = 13) and 61-70% correct (N = 10). Ten participants (29%) accurately judged their score, 19 (56%) overestimated, and four (12%) underestimated. The two lowest scores accurately self-rated. While the majority overestimated their score, it is not clear by how much as the offered ranges were 10-percentage points. Their projected scores and their actual scores did not significantly differ (F [4, 28] = 1.60, p =.201, η^2 = .186). Participants responded that the signs (N = 16; 48%) were an easy component of the test, followed by vocabulary and pictures (N = 5 each; 15%). Many cited the speed of the assessment and picture details as the most difficult aspects (N = 9 each; 27%), followed by signer's perspective (N = 6; 18%), and visibility and attention to the task (N = 3 each; 9%). Finally, ASL-RST performance weakly and insignificantly related to 51U performance at the end of ASL IV (r = .147, p = .430; r of .10 to .30 = weak; .3 to .5 = medium; .5 to 1 = strong).

ERROR ANALYSIS

To determine specific areas of difficulty, I conducted an item analysis of participant errors. Seven items were missed by more than 50% of the participants. Six of these were the last (i.e., most difficult) items. Three of these were spatial verb (location) and two were role shift. Another 6 items were missed by 33-42% of participants; these were spread across grammatical categories. No apparent patterns by grammatical category appeared. For instance, four Spatial Verbs Location items were often missed (by 39-79% of participants) but the other four items in the same category were correct more than 75% of the time.

51U TASK

I present 51U total scores and data by target handshape in Table 2. Nearly 70% of participants produced between 21 and 40 total items. For the 5 handshape there were 300 different produced items, 127 (42%) which were produced by only one participant (e.g., BLOW-TOP, CLARINET, WOOD) (note: ASL signs are glossed in English using small capital letters within text; Valli & Lucas, 2000). Twenty-seven students (31%) produced items with number incorporation (e.g., 5-MINUTES, 5-WEEKS, TIME-5, etc.). Four family members (MOM, DAD, GRANDPA, and GRANDMA) were the most frequently produced 5 handshape signs across participants at 51 to 57 productions per sign. FINE (30), FINISH (23), and SCHOOL (19) were the next most frequent items. Errors were infrequent and consisted of repetitions or signs that utilized the 5 handshapes on the non-dominant hand, such as START, SHOW, and READ.

Table 2. Comparison of Deaf adults and M2L2 ASL learners on the 51U task.

	M2L2 Learners	Deaf Adults
N	86	9
Total 51U range	13-65	27-58
Total 51U M, SD	31.7, 10.0	38.2, 17.0
5 handshape M, SD	12.7, 4.6	15.8, 3.2
5 handshape range	3-26	11-21
5 handshape signs produced by only one participant	42%	74%
5 handshape number incorporation (e.g., 5-WEEKS, 5-YEARS, etc.)	22%	0%
1 handshape M, SD	12.2, 4.8	17.1, 5.2
1 handshape range	3-29	11-28
1 handshape signs produced by only one participant	31%	58%
1 handshape body part signs (e.g., EYES, NOSE, etc.)	4%	9.2%
1 handshape time (e.g., DAY, WEEK, etc.)	7%	1%
U handshape M, SD	6.8, 3.3	9.6, 4.1
U handshape range	1-17	5-18
U handshape signs produced by only one participant	25%	58%

Learners produced 164 different items for the 1 handshape, 51 (31%) of which were produced by only one participant (e.g., BELIEVE, DIAMOND-SHAPE, FAMOUS, etc.). Just over half of the participants produced time-related signs (e.g., WEEK, MONTH, TIME, etc.) and 22% produced body-part signs. The most frequently produced signs were THINK (25), UGLY (18), YOU (17), ME, and MONTH (16 each). Errors were infrequent and consisted of G handshape substitutions (e.g., GLASSES, GOSSIP, GROUP) or the 1 handshape on the non-dominant hand (e.g., PRACTICE, SPECIAL).

Learners produced 83 different signs for the U handshape, 25% which were produced by only one participant (e.g., NERD, SUSHI, SWING, etc.). CHAIR (35), USE (34), NAME, and CUTE (33 each) were the most frequently produced items. Errors were rare and mostly consisted of the V handshape (i.e., splayed index and middle fingers) used as a "2" in place of the U handshape (i.e., index and middle fingers held together), such as 12 and 22.

There was no relation between 51U score and participant age (F [3, 82] = .556, p = .646, η^2 = .020) (η^2, or partial Eta squared, measures the proportion of variance accounted for by a given variable). There was a significant difference between years of signing experience and 51U score (F [2, 83] = 4.08, p = .020, η^2 = .090); 9% of all variance in 51U score is attributable to years of signing experience. Those with 3 or more years of experience (N = 22, M = 34.0, SD = 7.50) scored significantly higher than those with 2 years of experience (N = 14, M = 25.1, SD = 2.88), although the correlation between 51U score and number of years of signing experience beyond three years was not significant (N = 22, r = .070, p = .750; r of .10 to .30 = weak; .3 to .5 = medium; .5 to 1 = strong). Two participants had an immediate deaf family member and three had extended deaf family members; however, for these five participants, 51U scores did not significantly correlate with years of signing experience (r = .312, p = .547). Interpreting majors (N = 57, M = 31.4, SD = 10.01) scored higher than both deaf education majors (N = 16, M = 26.6, SD = 7.37) and deaf studies minors (N = 11, M = 25.3, SD = 10.70) but these differences were not statistically significant (F [3, 82] = 2.68, p = .052, η^2 =.089), suggesting that while not significant, major also accounts for nearly 9% of the variance in 51U score.

Self-reported hours of ASL use significantly related to 51U score (r = .260, p = .016). Only academic hours (M = 7.15, SD = 5.42, r = .352, p = .001) moderately and significantly related to 51U score (social hours: M = 4.93, SD = 5.15, r = .049, p = .654). Finally, there was a significant difference between self-reported fluency and 51U score (F [2, 83] = 3.39, p = .039). Those who self-rated as *fluent* (N = 4, M = 38.8, SD = 14.36) scored significantly higher than those who self-rated as *basic* (N = 15, M =25.1, SD = 7.74, p = .038, η^2 = .075); self-rated fluency accounted for 7.5% of the variance in 51U score. There were no differences for those who self-rated as *conversational* (N = 67, M = 29.8, SD = 9.77).

51U PRODUCTION STRATEGIES

A subset of participants (N = 63) were asked what strategies they used to produce different items related to handshapes. The majority (N = 36, 57%) cited activating prior vocabulary and conversations as their production strategy. A smaller portion (N = 13, 21%) reported moving the target handshape to different locations. Others (N = 8, 13%) reported looking at the handshape to produce items and a few cited thinking about known categories (N = 7, 11%). One student stated: "Signs that I already knew. Where can that sign be located and how can I use that sign as a classifier?" which demonstrates her flexibility in thinking during this task.

DEAF ADULTS 51U TASK

The deaf adults scored higher overall and across handshapes in comparison to the M2L2 learners (see Table 2). They produced 105 different signs for the 5 handshape, 74% of which were produced by only one participant, including SLAP, STROKE-BEARD, PEACOCK, etc. Most frequent items were AREA (5), DAD, MOM, GRANDMA, and GRANDPA (4 productions each). Besides production of "5th"

by one deaf adult, no responses related to number incorporation. They produced 103 different signs for the 1 handshape, 57% of which were produced by only one participant (e.g., LIGHTNING, LEGS-RUN (with inverted 1 handshapes on each hand), VODKA, etc.). NOSE (5), EYES, and WHERE (4 each) were the most frequently produced items. They produced 57 different items for the U handshape, 58% of which were produced by only one participant (e.g., NERD, SUSHI, SWING, etc.). CUTE (7), GOTCHA (4), HURRY, and NAME (4 each) were the most frequently produced items.

Deaf Adult 51U strategies

Nearly all deaf adults looked at the target handshapes during the task in an attempt to produce more signs; one deaf adult (oldest deaf adult who began signing at age 18) made up signs with the U handshape by switching the accurate handshape of a sign with the U handshape (i.e., CORN, etc.). Another deaf adult repeated previously produced signs as an attempt to facilitate production of different ones, while a third used non-manuals to distinguish between RIGHT-HERE, RIGHT-THERE, OVER-THERE for the 1 handshape. Many of the deaf adults commented during the task that their "mind was frozen" or that they could not think of any additional signs, showing that they were aware of their knowledge related to this task. One commented: "Wow, [this task] challenged me."

Discussion

ASL-RST

First, I aimed to document M2L2 ASL learners' receptive ASL skills and awareness of those skills at the end of ASL IV. Using the ASL-RST (Enns et al., 2013), ASL learners scored between 45% and 88% correct but no student scored at ceiling. These scores are slightly lower than previous scores for more experienced M2L2 ASL learners (i.e., those who had used ASL for at least 3 years beyond the classroom setting; range 64-95%), deaf adult late ASL learners (i.e., acquired ASL between 5 and 14 years of age and had 5 to 39 years of experience using ASL; range 56-100%) (Lieberman, Borovsky, Hatrak, & Mayberry, 2014), and a sample of non-native signing deaf students aged 18-22 (range = 73-86%; Beal-Alvarez & Figueroa, 2016). While this assessment was designed for native or near-native signing children up to 13 years of age, very few participants, deaf or hearing, have scored at ceiling. However, ASL-RST results provide a snapshot of participants' receptive ASL skills at the end of their ASL IV course across nine grammatical categories, which can serve as a road map for learners focused on improving their ASL skills and ASL instructors who desire to tailor their instruction to their students' individual learning needs, as discussed in instructional implications below.

51U Task

The present group of learners performed similarly to previous M2L2 learners on the 51U task at the end of ASL IV (Beal & Faniel, 2018) and higher than deaf students aged 19-21 (Beal-Alvarez & Figueroa, 2016); however, they performed lower than deaf university students (Morere, Witkin, & Murphy, 2012) and the present sample of deaf adults (see Table 3). The deaf adults demonstrated greater depth and breadth in their sign production in this task and different production strategies than M2L2 learners, such as manipulating one parameter to access and retrieve additional signs. This reflects a difference in how deaf signers (the majority of whom were late learners of ASL) process ASL phonology within a retrieval task and supports previous findings of differences among native and non-native signers related to ASL phonology. Previous results were overwhelmingly related to discrimination and reproduction of signs based on ASL parameters, while present findings expand results for ASL production based on one given parameter.

Table 3. Participant performance on the 51U production task across deaf and hearing groups.

Participant Sample	N	51U Total Mean (SD)
Deaf Adults (present study)	9	38.2 (17.0)
Deaf Gallaudet students[a]	48	35.0 (9.9)
Hearing M2L2 university students (present study)	86	31.7 (10.0)
Hearing M2L2 university students[b]	55	28.2 (9.0)
Deaf U. S. high school students[c]	12	24.4 (9.2)

Note. [a]Morere, Witkin, & Murphy, 2012; [b]Beal & Faniel, 2018; [c]Beal-Alvarez & Figueroa, 2016

For the expressive task, learner factors including signing three or more years (similar to Beal, Scheetz, Trussell, McAllister, & Listman, 2018), being an interpreter major (different from a smaller sample in Beal & Faniel, 2018), self-reported fluency (similar to Beal & Faniel, 2018; Beal, Scheetz, Trussell, McAllister, & Listman, 2018; Schlehofer & Tyler, 2016) and self-reported academic hours spent using ASL related to higher 51U performance. These factors directly relate to time spent using the language. Six of the M2L2 learners with more than three years of ASL experience had a deaf family member and the rest had exposure to ASL in K-12 school. However, it remains unclear how participants' age of ASL acquisition, the amount of use, and the fluency of their communication partners affects M2L2 skills. Additionally, self-report of ASL use can vary depending upon other forms of sign used (e.g., Pidgin Signed English (PSE) and Signing Exact English (SEE); Corina, Hafer, & Welch, 2014). Interpreter majors, who take additional courses related to ASL compared to deaf education and deaf studies minors at the present university performed higher on the 51U task. The present university recently added ASL V and ASL VI courses as requirements for both interpreting and deaf education majors to increase their experience with ASL. Immersion experiences, where language learners live in communities in which the target language (i.e., ASL) is used for all communication, in contrast to shorter ASL events during which learners only visit with members of these communities, may be one effective curriculum supplement to ASL instruction at the university level to increase learners' ASL proficiency. The present university recently established an ASL Living Learning Community (Maltby, Brooks, Horton, & Morgan, 2016) in one of its dorms, which includes established hours for ASL use and monthly presentations related to ASL for residents.

INSTRUCTIONAL IMPLICATIONS

Previous researchers suggested explicit instruction in self-evaluation of ASL skills (Bontempo & Napier, 2007; Nicodemus & Emmorey, 2015; Stauffer, 2011) to increase learners' self-evaluation accuracy. Present findings support these conclusions, as about half of ASL students at the end of ASL IV overestimated their receptive comprehension based on the ASL-RST, similar to previous overestimation findings (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussell, McAllister, & Listman, 2018; Lang, Foster, Gustina, Mowl, & Liu, 1996; McDermid, 2009; Nicodemus & Emmorey, 2015; Schick, Williams, & Bolster, 1999; Stauffer, 2011; Yarger, 2001). However, within the present sample, those who self-rated as fluent signers performed higher than those who self-rated as basic on the 51U task, similar to previous findings (Beal, Scheetz, Trussell, McAllister, & Listman, 2018, 2018b; Schlehofer & Tyler, 2016).

Individual student scores on the ASL-RST provide M2L2 learners with evidence of their actual performance in nine areas of ASL versus their self-perceptions. Receptively, learners reported that the speed of the ASL-RST was one area of difficulty, even though the assessment was developed for younger children, which might suggest differences in M2L2 in ASL processing speed. The ASL-RST is designed for native or near-native signers, who would likely process the signed item near automatically and know exactly what picture they were looking for, as opposed to ASL learners who engage in more surface-level processing, such as a focus on vocabulary, to discriminate differences among stimuli (Corina, Hafer, & Welch, 2014; Mayberry, 2010). Instructors might have students focus on what they thought they understood versus the message actually conveyed as one embedded element of metacognition for M2L2 learners. Specific to receptive grammatical categories, M2L2 learners might need additional instructional attention related to comprehension of signer's perspective, role shift, spatial verbs location, size and shape specifiers, and number-distribution. This is not surprising, given M2L2 learners' documented difficulty in the productive use of depictive constructs in their narratives (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussell, McAllister, & Listman, 2018; Taub, Galvin, Pinar, & Mather, 2008). Other areas suggested for explicit instruction related to learner comprehension include ASL phonology and manipulation (Bailey, 2013; Bochner et al., 2011) and fingerspelling (Thoryk, 2010; Geer & Keane, 2017), to increase M2L2 signers' proficiency. Future investigations might determine when M2L2 ASL learners are ready for explicit instruction of these more complex categories (Geer & Keane, 2017; Thoryk, 2010).

Specific to ASL sign production, some M2L2 learners relied on number incorporation for the 5 and 1 handshapes and/or recalled previously learned vocabulary from ASL classes, while deaf adults appeared to produce more signs based on manipulating the location and movement parameters. M2L2 learners may need instruction in parameter manipulation, such as rimes in ASL (i.e., signs that vary by only one parameter; e.g., SUMMER and DRY) and how change in one parameter changes the meaning of a sign. Perhaps administration of a receptive assessment specific to ASL phonology, such as an adapted version of the ASL Phonological Awareness task (ASL-PA, McQuarrie & Abbott, 2013; developed for deaf children) or the task developed by Hildebrandt and Corina (2002; developed for deaf native signers, deaf late signers, and hearing non-signers) might tease out connections between comprehension and production of ASL parameters as learners develop their ASL skills. Within both tasks, participants judge the similarity of 3-4 sign options compared to a target sign via video clips. Response options differ by 1-2 parameters. Deaf school-aged students were accurate in handshape and location judgments but less so when movement judgments were included. It would be of interest to see how university M2L2 ASL learners discriminate among ASL parameters receptively, such as if they have more difficulty with handshape and location within this type of task, as previously reported (Bochner et al., 2011, 2016; Williams & Newman, 2016).

Despite similarities in ASL curricula used to teach M2L2 learners, there remains a lack of evidence on the effectiveness of ASL curricula, supplementary materials, instructional strategies, and the actual incorporation of L2 ASL standards (Ashton, Cagle, Kurz, Newell, Peterson, & Zinza, 2012) into instruction (Quinto-Pozos, 2011; Swaney & Smith, 2017; Thoryk, 2010). Swaney and Smith (2017) surveyed 180 ASL instructors at the university level and reported perceived gaps in available curricula related to vocabulary, grammar skills, classifiers (i.e., depicting constructs), and cultural information and that instructors frequently supplemented curricula with activities and games. Thoryk (2010) compared results of a fingerspelling intervention implemented in ASL II, IV, and VI university courses with "predominantly female, hearing, and younger than thirty years of age" learners (p. 106) with little ASL experience overall to a control group and reported no difference in accurate fingerspelling comprehension when provided with explicit instruction in fingerspelling (i.e., use of a packaged program with fingerspelled vocabulary, stories, and practice activities) and typical fingerspelling instruction (i.e., fingerspelling instruction in beginning ASL then used "where appropriate in natural conversations" p. 109). Thoryk (2010) noted that the implemented fingerspelling program did not contain recommended instructional strategies specific to "the field of word recognition in reading" (p. 114), in addition to feedback towards a learning goal and correction on learners' productions. Based on student and instructor feedback, Thoryk recommended interesting and actively engaging practice tasks in which learners have "some degree of control and autonomy within the task" (p. 114), similar to games, as proposed by other curricula reviews (Swaney & Smith, 2017).

In contrast to Thoryk's findings, Geer and Keane (2017) implemented an explicit instruction versus implicit fingerspelling training program with 18 university ASL learners in their third semester of ASL. Both programs provided video clips of holds and transitions within fingerspelled words, but the explicit condition added description of different types of phonetic variation exhibited in the video clips when producing the manual letters during fingerspelling (i.e., epenthetic movements, such as wrist supination with a U-R combination, see Geer & Keane, 2017, pp. 446-447). Geer and Keane posit that conscious consideration of phonetic variation allowed students to predict subsequent letters within fingerspelled words, leading to quicker processing of spelled words. This highlights one form of contrastive analysis, in which components of language are analyzed within a target language and in comparison, to a first language. Buisson (2007) reported that explicit instruction in rules for English glossing (i.e., students' L1) of ASL (i.e., target language), or "written equivalents of ASL sentences" (p. 331) improved beginning ASL university learners' ASL grammatical knowledge based results of a multiple-choice pre-posttest focused on information taught within the glossing lessons. The training included explicit instruction in an ASL grammatical rule, examples, glossing practice, and exercises in which students matched glosses to English sentences and vice versa with pop-up tutorial feedback windows on each multiple-choice response and use of previous rules across subsequent lessons.

Besides explicit instruction in fingerspelling and glossing, evidence related how to use contrastive analysis with English as an L1 and ASL as an L2 remains scant. It is unclear if the use of spoken English for clarification and written English for recording information during M2L2 ASL instruction facilitates or inhibits ASL acquisition (Quinto-Pozos, 2011; Thoryk, 2010). Additionally, learners must contrast a sequential auditory- and print-based language with a visual and print-less language. Wolbers and colleagues (Dostal & Wolbers, 2016; Wolbers et al., 2015; Wolbers, Bowers, Dostal, & Graham, 2013) demonstrate support of using ASL as an L1 paired with contrastive analysis to learn English as an L2 for deaf students; it is unclear exactly how to use this strategy in reverse with M2L2 ASL learners. Additionally, evidence-based instructional strategies that address how to teach M2L2 ASL learners to transition from the sequential morphology of English to the simultaneous morphology of ASL, such as expressing multiple perspectives in ASL through the use of constructed action and depicting constructs, remain scarce. Within their K-16 ASL standards, Ashton and colleagues (2012) provided a post-secondary example of ASL instruction that embeds multiple standards within an in-depth analysis of deaf sports organizations that includes verbs such as *develop, view, interview, examine, contrast*, and *attend*, all of which suggest engaging and active involvement in instructional tasks paired with standards (pp. 58-59). Finally, ASL learners requested viewing multiple sign language models within curricula for exposure to variation within sign language (Storey & Jamieson, 2004; Thoryk, 2010).

LIMITATIONS AND FUTURE RESEARCH

In the present study about half of ASL students at the end of ASL IV overestimated their receptive comprehension based on the ASL-RST, similar to previous overestimation findings (Beal-Alvarez & Scheetz, 2015; Beal, Scheetz, Trussell, McAllister, & Listman, 2018; Lang, Foster, Gustina, Mowl, & Liu, 1996; McDermid, 2009; Nicodemus & Emmorey, 2015; Schick, Williams, & Bolster, 1999; Stauffer, 2011; Yarger, 2001); yet there was not a significant difference between their projected and actual performance. It is unclear by how much they overestimated due to the 10-point scale used in the present study; future research might use a fill-in number format and investigate relations to learners' actual scores more in-depth.

It is possible that the change in administration from individual administration with paper and pencil to group administration with Google Forms affected participant score accuracy, as the task requires continuous visual attention and participants alternated between watching the items on the computer screen and selecting a response on their internet-connected devices. However, given that the present results related to none of the analyzed learner factors, participant performance on another ASL receptive measure that is specifically developed for M2L2 learners, such as the ASL Discrimination Test (Bochner, Christie, Hauser, & Searls, 2011) or the ASL Comprehension Test (Hauser et al., 2016) might be investigated when available. In sum, university ASL learners and instructors can use results from receptive and expressive ASL tasks that are efficient to administer and score to provide feedback and guide their immediate instruction of M2L2 learners, in addition to more holistic end-of-program assessments (e.g., ASLPI, SLPI). They also might include task-related learner self-evaluation and reflection to identify individual learners' areas of need within ASL instruction, such as the grammatical categories included within the ASL-RST. As noted by McKee and McKee (1992), "The formalizing of students' and teachers' insights about the business of learning ASL might offer some useful reflections of reality to curriculum designers, students, and teachers" (p. 155), especially when paired with data-based instructional strategies, curricula, and standards.

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