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Limits to resilience: investigating narratives in ASL signers who acquired their first language in adolescence

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ABSTRACT

The present study investigated narrative abilities in five deaf adults who grew up with impoverished language access until learning American Sign Language (ASL) after age 12. We found that these signers generally provided sufficient information and structure, and that their referent tracking showed pragmatic awareness and ability to vary the explicitness of referring expressions according to addressee needs. However, both story structure and referent tracking patterns were highly variable among signers, resulting in incomplete stories and underspecified reference in some signers. Previous studies have argued that the narrative domain is resilient to age of acquisition effects, finding that narrative abilities in children who learn sign language in childhood are similar to those who learn from birth. Although based on a small sample, our results suggest that such resilience does not necessarily extend to cases where language is first acquired in adolescence. We offer suggestions for future research and discuss implications of comparing the language of individuals growing up deprived of accessible, conventional language input to the those with full access to language.

Introduction

When deaf children are born into hearing families, as most deaf children are (Mitchell & Karchmer, 2004), obtaining full access to language presents a challenge. Deaf individuals may spend years of their childhood with insufficient access to a sign language and/or the spoken language of the surrounding community, and in rare cases may reach adolescence having received little to no conventional language input (Grimshaw et al., 1998; Mayberry & Fischer, 1989; Morford, 2003; but see Koulidabrova and Chen Pichler, 2021 for a discussion of the importance of the initial communication systems developed by deaf and hard-of-hearing children growing up language deprived (Hall, 2017)/with adverse childhood communication experiences (Kushalnagar et al., 2020). The question addressed here is what the narrative skills of late learners of a conventional first language look like. Narratives depend on grammatical and pragmatic skills which tend to be mastered later in typical development (Hickman, 2003). Later acquired skills may depend on successful acquisition of language skills that typically emerge earlier, but evidence shows that later language exposure leads to challenges even in the early stages of language acquisition. Narrative abilities in late first language learners may therefore look unlike those in typical language learners.

The present study investigates narrative story structure and referent tracking in five individuals who learned American Sign Language (ASL) after childhood. To preview, unlike previous studies that have observed resilience to age of acquisition effects in these domains when language is first acquired later in childhood (Gür & Sümer, 2022; Keleş et al., 2023), we show that such effects may not fully

extend to when language is first acquired in adolescence. We show that basic event description and referent tracking is subject to significant individual variation in the late first language learners in our sample, some of which may suggest limited pragmatic awareness. Our results also point to potential challenges with morpho-syntactic marking which – while not an issue in simple narratives – may cause problems in more complex narratives.

To provide the necessary background, we first provide an overview of the literature on late first language learning. We then discuss story structure and cohesion in spoken languages, followed by a summary of referential expressions and referent tracking in sign languages.

Background

Learning language later in life

Some Deaf individuals have little to no access to linguistic input until early childhood, late childhood, or even adolescence due to a variety of factors (Goldin-Meadow & Feldman, 1975; Goldin-Meadow & Mylander, 1990; Grimshaw et al., 1998; Mayberry & Eichen, 1991; Mayberry & Lock, 2003; Morford, 2003; Newport, 1990). Research has shown that the later language acquisition begins, the greater the impact on ultimate attainment (Newport, 1990; see also Mayberry & Kluender, 2018). Despite this, more research is needed to understand the details of when and how language abilities begin to vary as a function of age of acquisition. Below, we review evidence from studies of development of lexical, grammatical, and discourse competencies in individuals who learn their first (conventional) language at various stages of childhood and adolescence. Studies in this domain typically compare the linguistic structures of individuals growing up with impoverished language input to those of growing up with full access to language. Recent approaches, however, have increasingly called attention to problems with this approach (e.g. Henner & Robinson, 2023; Koulidobrova & Pichler, 2021). These problems include a lack of attention to the remarkable flexibility and adaptation of the communicative systems of the individuals in question and the competencies and strategies they develop that may look different from those typically considered as benchmarks. At the end of section 2, we include brief discussion of research into narratives in late first language acquisition which highlights the abilities of these individuals outside of the perceived norm.

Typical patterns of acquisition in late learners

Lexical development appears very similar in delayed first language acquisition compared to typical language development (Berk & Lillo-Martin, 2012; Ferjan Ramirez et al., 2014). Like child language learners, adolescent first language learners' first productions consist of limited single words, and early vocabularies have been shown to be structured similarly with respect to the proportion of nouns, verbs, function words, etc., to those of typically developing children in both spoken and signed languages (Anderson, 2002; Bates & Goodman, 1997). Mean length of utterance (MLU) increases steadily in the first years of language acquisition irrespective of age of acquisition, and in fact in the early stages, this appears to happen more rapidly in late learners than those who learn from birth (Ferjan Ramirez et al., 2014; Morford, 2003). Later learners also acquire at least some elements of morphology, such as simple verb agreement marking and classifier constructions (Morford, 2003; discussed in more detail below). Recent work on syntactic development in adolescent first language ASL learners has shown that basic word order in sign production develops similarly, if in a somewhat protracted manner, in late language learners compared to child language learners (Cheng & Mayberry, 2019).

Atypical acquisition in late learners

Beyond lexical development, simple morphology, and basic word order, research has shown profound age of acquisition effects on ultimate attainment in different areas of language and linguistic processing (Cormier et al., 2013; 1990; Emmorey & Corina, 1990; Emmorey et al., 1995; Mayberry & Fischer,

1989; Morford, 2003; Newport, 1988). Mounting neurolinguistic evidence additionally suggests that late language exposure is linked to differences in patterns of activation in the brain (Ferjan Ramirez et al., 2014; Mayberry & Kluender, 2018) as well as in brain pathways (Cheng et al., 2019) and anatomical brain structures (Cheng et al., 2023).

Age of acquisition effects appear to be especially severe with respect to morphosyntax. Newport (1990) reports low accuracy in late learners on production and comprehension of verb agreement and complex classifier constructions. Emmorey and colleagues found evidence that late learners were unable to integrate verb agreement information during online sentence processing (Emmorey et al., 1995). Boudreault and Mayberry (2006) tested grammatical processing of a range of ASL morphosyntactic phenomena, including verb agreement marking and classifier constructions, and found later ages of acquisition to correlate with poorer outcomes. Another study by Mayberry and colleagues showed that while late learners showed comprehension of several morphosyntactic structures typically acquired in early childhood, they exhibited difficulty with structures typically acquired in later childhood (Mayberry et al., 2023). Testing production of agreement verbs in two signers first exposed to ASL at age 6, Berk (2003) reported person agreement errors that persisted for years following the initial exposure to ASL. Moreover, although late learners acquire the production of basic word order similarly, and in a similar time frame as individuals learning from birth (Cheng & Mayberry, 2019; Newport, 1990), evidence suggests that word order comprehension may not be fully dissociated from event structure in late learners. Specifically, Cheng and Mayberry (2021) found that late learners' comprehension was above chance level when presented with basic SVO sentences describing plausible events (e.g., BOY BITE BANANA) but fell below chance level when the sentences described implausible events (e.g., BANANA BITE BOY), suggesting that the most plausible event structure, rather than word order itself, is driving comprehension.

Importantly, length of experience with language after the initial years does not seem to influence ultimate attainment (Cheng & Mayberry, 2021; Mayberry & Eichen, 1991; Newport, 1990). Thus, it seems that age of first language acquisition introduces variation in linguistic structure and processing, especially as it relates to morphosyntax. These effects become more pronounced the later in life language is acquired and do not appear to be affected by length of experience with the language.

Narratives and the acquisition of story structure

Telling narratives is an important part of human communication (Strömquist & Verhoeven, 2004). Narratives help us make sense of our experiences, contributing to crucial concepts such as socialization, creation of identity, and the transmission of culture (Van Deusen-Phillips et al., 2001). At present, we know little about the extent to which delays in language acquisition may impact the ability to engage in narrative practices.

Structuring the story content both temporally and causally is an important part of a narrative. Many studies have proposed sets of principles that characterize a well-formed story (e.g., Labov & Waletzky, 1967; Mandler & DeForest, 1979; Mandler & Johnson, 1977). According to the account of Labov and Waletzky (1967), basic story structure minimally contains a set of components, such as a setting, a complication, a resolution, and an evaluation. Acquisition studies have shown that although expectations about basic story structure might be present early on, children below the age of five are generally unable to explicitly include and describe all the components of basic story structure (e.g., R. A. Berman & Slobin, 1994), with more story components included as age increases (Castilla-Earls et al., 2015; Khan et al., 2016; Ögel Balaban et al., 2020; Schneider et al., 2006).

Acquiring cohesion

Cohesion is another important part of narrative ability. Cohesion refers to how information pieces and sentences are linked together through linguistic devices by indicating relationships between parts of the story and between clauses in the discourse (Chafe, 1976, Halliday & Hasan, 2013; Strömquist &

Verhoeven, 2004). Typically developing school age children who do not yet produce adult-like narratives may well have acquired adult-like phonetic and morphological forms of, for example, the referring expressions used to create cohesion (*he* vs. *she*, etc.), and are often quite capable of using these in non-narrative contexts or in situations where reference is made clear by the context (Hickmann, 2003; Karmiloff-Smith, 1985). Cohesion is an essential component of a skilled narrative, and it is a multifaceted ability that involves linguistic as well as pragmatic skills. Discourse skills, including narrative skills, in typically developing children continue to be developed and refined into the school years (Hickmann, 2003; Karmiloff-Smith, 1985; R. Berman & Verhoeven, 2002), that is, after development at the word and sentence level is largely completed (Slobin, 1985). Because of this, it has been assumed that acquiring referential cohesion might depend on prior mastery of other linguistic areas (M. Bamberg, 1986).

Referent tracking

The present study focuses specifically on referent tracking as a part of cohesion. Referent tracking, keeping track of who is doing what to whom, is accomplished by varying referring expressions in the most efficient way while also making it clear to the addressee what is happening with the entities of the narrative. This means that all relevant entities and characters (e.g., “the man selling balloons”) should be explicitly introduced before they can be talked about with less specific forms (e.g., “he”). It also means that once an entity has been introduced, it may no longer be appropriate to refer to it with a fully explicit form. Mature referent tracking can thus be characterized as the selection of referring expressions on a continuum from least to most presupposing referring expressions (Hickman 2003:11). More specifically, senders tend to make *introduced reference*, i.e., the first mention of an entity, explicit and descriptive. After introducing an entity into the discourse, senders tend to make subsequent mentions less explicit. A continued reference, called a *maintained reference*, in which the subject of the current clause was also mentioned in the previous clause, tends to be the least explicit of all. Subsequent mentions that happen after the referent has been absent from the discourse for the length of one or more clauses are called *reintroduced references*. Such references tend to be more explicit than maintained references, but less explicit than introduced references.

Referent introductions are frequently accomplished using names or lexical noun phrases. Beyond the first mention, however, the exact linguistic expressions used to mark different degrees of explicitness vary. Pro-drop languages tend to use zero anaphora for maintained reference (Clancy, 1980; Hyuk (Sarah) Jung, 2004; Polio, 1995; Sorace & Filiaci, 2006) while non-pro-drop languages generally use pronominal forms in the same contexts (Hickman, 2003; Gullberg, 2006; Perniss & Özyürek, 2015; Yoshioka, 2008). Sign languages often use zero anaphora in the context of classifier predicates and constructed action in signed languages for maintained reference (Frederiksen & Mayberry, 2016; L. A. Swabey, 2002, 2011; Morgan, 2005), as will be discussed in more detail below. Referent reintroductions may be accomplished with zero anaphora, pronouns, and lexical noun phrases (Clancy, 1980; Debreslioska et al., 2013; Frederiksen & Mayberry, 2016; Gullberg, 2003, 2006; Keleş et al., 2023; Morgan, 2005; Perniss & Özyürek, 2015; Yoshioka, 2008).

Acquiring referent tracking

Felicitous referent tracking requires the integration of several skills. Not only must the language user be able to correctly form and select words, apply morpho-syntactic processes such as verb agreement, and correctly construct sentences, but it is also necessary to integrate cognitive and socio-pragmatic abilities, such as the ability to talk about absent referents and take the knowledge state of the addressee into account (R. A. Berman, 2004; Hickmann, 2003; Tolchinsky, 2004). The lack of pragmatic abilities, in particular the ability to take the perspective of the addressee, can result in variations from the typical adult pattern, such that children often select inappropriate reference forms and, specifically, introduce referents with pronouns and null forms that fail to accomplish an explicit introduction (Aksu-Koç & Nicolopoulou, 2015; Gutierrez-Clellen & Heinrichs-Ramos, 1993; Hickmann & Hendriks, 1999; Küntay, 2002; Orsolini et al., 1996; Wong & Johnston, 2004). Consequently, young children do not

follow the adult pattern of reference tracking when they first begin to create narratives, and cohesion problems are pervasive long after children master the phonology, morphology and syntax of the language(s) they are exposed to (Hickmann & Hendriks, 1999; Karmiloff-Smith, 1979, 1985; Morgan, 1998, 2005). Children of up to 7–9 years may not have acquired the typical adult pattern (see Hickman, 2003: ch. 5 for an overview), and development of cohesion may continue into adolescence (B. Bamberg, 1984; R. A. Berman, 2004).

Referring expressions in American sign language

American Sign Language (ASL) is the main sign language used by the Deaf community in many parts of North America. ASL makes use of proper and lexical noun phrases, overt pronouns, and zero anaphora for referent tracking. Nouns can be signed or, less frequently, fingerspelled. Bare nouns are frequent in ASL (Sandler & Lillo-Martin, 2006), including in narratives (Frederiksen & Mayberry, 2016; L. Swabey, 2011). Overt pronouns are pointing signs indicating present or non-present entities.¹ Pronominal points to non-present entities get their meaning from the locus they indicate. Loci are areas of signing space that have been associated with a referent (Friedman, 1975; McBurney, 2002; Winston, 1991).

The use of null arguments is also common in ASL (Lillo-Martin, 1986). Overt arguments of predicates can be dropped when the reference is sufficiently clear from the context. Null arguments used to track reference in a narrative are called zero anaphora. Zero anaphora can occur in the context of verbs. ASL has different classes of verbs (Padden, 1988), including agreement verbs, which can be modified in space to indicate person agreement, and plain verbs which cannot. In ASL, it is possible to drop arguments of both types of verbs (Lillo-Martin, 1986). Agreement is marked on verbs by modifying hand orientation or path movement, such that the verb moves between two areas in space, either between two spatial loci (see Figure 1) or from the signer's body to a locus (Figure 2). The latter can occur when the signer has “role-shifted,” that is, has indicated with body posture or gaze that they have mapped a referent from the narrative onto themselves (e.g., Lillo-Martin, 1995). Agreement marking, however, is not obligatory. Emerging evidence from other sign languages may help illuminate this point, as sign languages appear to be similar cross-linguistically in having some verbs that allow the use of space to mark verb agreement (Sandler & Lillo-Martin, 2006). Corpus studies of Australian Sign Language (Auslan) and British Sign Language (BSL) suggests that signers



Figure 1. The agreeing verb GIVE with two loci in signing space (from Frederiksen & Mayberry, 2016, p. 52).

¹But see Koulidobrova & Lillo-Martin (2016) for a discussion of pointing signs as demonstrative instead of personal pronouns.



Figure 2. The agreeing verb GIVE with use of spatial loci in a role-shifted context from (Frederiksen & Mayberry, 2016, p. 52).

may leave agreement verbs unmarked in 25–31% of cases (De Beuzeville et al., 2009; Fenlon et al., 2018). An agreement verb without agreement marking is identical to the citation form of the verb and thus has neither spatially marked path movement nor role-shift marking (Janzen, 2004).

Constructed action is another phenomenon that can occur with overt arguments or zero anaphora. In constructed action, the signer uses their body as if it were the body of an entity from the narrative (Cormier et al., 2013; Ferrara & Johnston, 2014), signing the dialogue or performing the action attributed to the entity whose perspective the signer is taking (e.g., Bellugi & Fischer, 1972; Lillo-Martin, 1995; Metzger, 1995). Like agreement verbs, constructed action may or may not have spatial marking. Signers can use lexical labels to overtly name the referent they are acting as, use spatial marking (Cormier et al., 2013; Emmorey, 2002; McKee et al., 2011; Morgan, 2005; Winston, 1991; Wulf et al., 2002), or use eye-gaze, or posture and facial expression indicating a specific referent (Engberg-Pedersen, 1993; Janzen, 2004; Lillo-Martin, 2012).

Finally, classifiers are also frequent in sign languages. Classifiers are handshapes with an iconic relationship to the referent (Frishberg, 1975; see Zwitserlood, 2012 for an overview), and thus identify referents based on physical and semantic criteria (Slobin et al., 2003). For example, a signer can use an upright index finger moving toward or away from the body to represent a person walking. Another type of classifier represents an object by tracing or outlining the shape of an object, such as a picture frame or a flower vase. Some classifiers are thus nominal in nature and can be used instead of a lexical noun; however, classifiers used as predicates are typically anaphoric and thus need to be identified with a lexical noun before being used with a zero anaphora.

Signed referent tracking, story structure, and their development

A growing number of studies investigate referent tracking in and across different sign languages (see overview in Ferrara et al., 2022). This research has found that signers tend to introduce referents with lexical noun signs, while subsequent mentions are accomplished primarily with zero anaphora from verbs and classifier predicates, with some lexical nominals used for reintroductions as well (Frederiksen & Mayberry, 2016; Hodge et al., 2019; Keleş et al., 2023; McKee et al., 2011; Morgan, 1998; L. Swabey, 2011; Wulf et al., 2002).

Signing children generally progress through the same developmental milestones as children acquiring a spoken language (Mayberry & Squires, 2006). As such, nouns appear early in sign production. The ability to refer to absent entities through pronominal pointing occurs around 3 ½ – 4 years and is not mastered until around 5 years (Hoffmeister, 1978; Loew, 1984; Petitto, 1987). The complex morphology associated with agreement verbs is also challenging (Lillo-Martin & Henner,

2021). Children initially use agreement verbs without the agreement marking (Meier, 1982). Their comprehension of verb agreement with non-present entities precedes their production, which typically begins after ages 3–4 years of age (Lillo-Martin et al., 1985). Classifiers and constructed action also exhibit protracted development in signing children (Lillo-Martin et al., 1985; Schick, 1987; Supalla, 1982). In ASL, classifiers within sentences are not mastered until around 4 years, due to articulatory and semantic complexity (Newport & Meier, 1985), and the more complex aspects of classifier use continue to develop until age 9–11 (Clibbens & Coventry, 1994; Karadöller et al., 2021; Slobin et al., 2003). Constructed action does not become adult-like until after age 12 (Morgan & Woll, 2003; Slobin et al., 2003; Morgan, 2005; see overviews in; Mayberry & Squires, 2006; Cormier et al., 2015). Children begin shifting their eye gaze and using facial expression to mark constructed action at around age 3–4, but these markers are neither appropriate nor consistent in timing and scope until age 6 or 7 (Emmorey & Reilly, 1998; Reilly, 2005).

Narrative development in deaf children

As in spoken language development, signing children struggle to choose appropriate referring expressions even when all the necessary linguistic forms have been acquired (Hoffmeister, 1978; Loew, 1984). Only a few studies have directly investigated how referent tracking is accomplished in children acquiring a sign language (Morgan, 1998, 2005, for BSL; Sümer, 2016; Gür & Sümer, 2022 for Turkish Sign Language [TİD, Türk İşaret Dili]; Reynolds, 2018 for ASL). The results of these studies show that children between 4–13 years old mostly introduce referents with full noun phrases, although the youngest signers often use inappropriate reference forms, such as constructed action and under-specified classifiers to introduce (Gür & Sümer, 2022; Morgan, 1998, 2005). To maintain reference, children use zero anaphora (Reynolds, 2018), and classifiers, though classifiers are used much less by younger signers than by adults (Morgan, 2005). Children of all ages use constructed action, but unlike adults, do not always vary how it is marked as a function of the saliency of the referent (Morgan, 1998, 2005).

Studies investigating story structure in deaf children have also shown a similar trajectory in deaf signing and hearing speaking children, provided that the deaf children have had sign language input from the earliest years (Morgan, 2005; Sümer, 2016; see also Rathmann et al., 2007). Deaf children's story retellings do not initially include all the necessary events and scene setting information. Morgan (1998) showed that the mean number of events included in retellings of the same story increased from 5.5 events in 4-year-olds to 19 events in adults and that only the 11–13-year-old children and the adults consistently included scene setting, i.e. descriptions of who, what, and where. Sümer (2016) also investigated inclusion of scene setting in TİD and found that Deaf children differed from Deaf adults in how often their narratives included scene setting elements.

Overall, this research replicates findings from spoken language research showing that children initially do not take their addressee's needs into account and therefore frequently fail to describe the necessary story elements and to introduce and maintain referents with the appropriate level of explicitness. However, to date much less is known about how narrative ability and referent tracking develops when language acquisition is atypical.

Narrative abilities in later language learners

If late first language learners acquire basic linguistic phenomena, but not the more complex ones, this may lead to narrative abilities that differ from those of adult signers who learned to sign from birth. While the complex morpho-syntax should be absent from late learners' narratives and may affect choice of referring expressions in narrative, the late learners' cognitive maturity and life experience may serve to boost their pragmatic awareness compared to what would be expected in children of similar grammatical ability.

Few studies have directly investigated narrative production in late learners. Becker (2009) investigated story structure and cohesion in children with delayed exposure to German Sign Language

(DGS) and found that they did not display age-appropriate narrative structure, compared to their hearing peers. However, research looking at the story telling capabilities of deaf adult individuals who use a non-conventional sign language has suggested that communicative competency and even artistry in pantomimic storytelling may be well-developed even outside conventional language (Green, 2017), in line with the argument that individuals deprived of conventional language input display remarkable and flexible communication adaptations (Henner & Robinson, 2023; Moriarty Harrelson, 2019). Leaving aside the possibility that different discourse strategies may be employed to the same effect (i.e. the creation of a coherent and engaging story) by communicators with different language experiences, it is possible that the life- and communication experiences of adult signers who learned a conventional language later in life may also enable them to create coherence and cohesion as traditionally measured, beyond what their grammatical competence, as normed against those who have learned the language from birth, would predict.

A small number of recent studies specifically investigating narrative ability in late language learners have in fact found that referent tracking in late childhood sign language learners looks similar to that of those who acquired the sign language from birth (Gür & Sümer, 2022; Keleş et al., 2023)., Gür and Sümer (2022) found no effect of age of acquisition on frequency of referent introductions in TİD. Numerically, children who were late learners exhibited a lower rate of referent introductions, but the effect was not statistically significant. Similarly, although late learning children performed referent introductions with constructed action as often as they did with lexical signs, whereas adults only introduced with lexical signs, the difference was not statistically significant. The results from Keleş et al. (2023) also showed highly similar patterns in late TİD learners and those who learned TİD from birth. The one difference identified was overexplicit reference in late learners, as they used fewer zero anaphora in maintained contexts compared to signers from Deaf families. The study by Becker (2009) similarly found that late learners of DGS used lexical noun phrases to identify reference shifts more frequently than signers from deaf families who more frequently used spatial marking or constructed action (but see also Cormier et al., 2013 who found no differences in BSL signers' framing of constructed action as a function of age of acquisition).

The evidence thus far suggests that age of acquisition has a limited effect on referent tracking but may affect the inclusion of story events. However, previous work has focused on deaf individuals who learned to sign in childhood. In the study by Gür and Sümer (2022) the late sign language learners had learned TİD around age six. Keleş et al. (2023), who found some age of acquisition effects, included participants with ages of sign language acquisition ranging from 3–17 years. The majority had learned TİD before age 13. Only two participants fell in the 14–17-year age range, and the study did not differentiate between earlier and later ages of acquisition. As such, it remains unclear whether the age of acquisition effect found in Keleş et al. (2023) may be driven in part by adolescent learners. As previous research has shown correlations between age of acquisition and ultimate attainment, we might expect differences in narrative abilities between those with earlier vs. later ages of acquisition.

The present study

In the present study we ask what narrative structure and referent tracking look like in adults who first began acquiring language in adolescence. We examine simple elicited narratives told by five late learners of ASL, investigating the structure of the narratives and how the participants track referents, and we compare the results with those of a previous study with Deaf signers who learned ASL from birth (Frederiksen & Mayberry, 2016; Frederiksen and Mayberry 2016). The main questions investigated are as follows: First, we ask whether learning ASL in adolescence affects basic story structure, specifically whether all events are mentioned in the narrative. If late language learners' age and life-experience enhances their pragmatic awareness, their story structure should look similar to that of individuals who have signed since birth and should thus include descriptions of all events necessary to comprehend the story. Second, we ask whether late language learning affects the introduction of story entities into the narrative. Gür and Sümer (2022) found a numeric but not statistically significant

lower rate of referent introductions in childhood TID learners. In the present study, we ask if referent introductions are similarly resilient when language acquisition takes place in adolescence. Third, we ask whether learning language later in life affects the choice of referring expressions for referent introduction, maintenance, and reintroduction. In the study by Keleş et al. (2023) the only difference related to age of acquisition was that the late learners used less zero anaphora to mark maintained references. Here, we ask whether this limited pattern of over-explicitness also holds true for later ages of acquisition. Given previous findings that morphosyntax is especially affected when language is learned late, we also asked specifically how late learners use morphosyntactic marking to indicate maintained and reintroduced reference.

Methods

Participants

The participants in this study were five Deaf adults aged 21–59 years. We refer to them with the pseudonyms Carlos, Cody, Martin, Maya, and Shawna. For various reasons, these individuals were not exposed to a sign language until they were adolescents. They learned ASL as their first language between the ages of 14–21 years (Table 1). Carlos, Cody, and Shawna lived together in a group home for a while, where they were immersed in ASL and Martin and Maya learned ASL when they immigrated to the US as adults (see Ramírez et al., 2013 for additional details about the backgrounds of Carlos, Cody, and Shawna, and see Mayberry et al., 2019 for details about Martin’s background. Maya began to regularly communicate in ASL around the age of 16; prior to this age she sporadically attended school for a few months at a time in more than one country).

In a previous study, we analyzed narratives from eight adult signers’ (mean age: 30.88, range 22–55) who had been exposed to ASL from birth from deaf parents and/or siblings (Frederiksen & Mayberry, 2016). The narratives were elicited using the same protocol as in the present study. We will compare the data from this group of signers to the participants in the present study where relevant.

Stimuli and procedure

Participants were first informed about the study. We explained that we were interested in how ASL signers tell stories but did not reveal our specific interest in story structure and referent tracking. The participants then gave consent. To obtain informed consent for the present study, a research assistant, who is a deaf ASL signer and highly experienced interacting with late L1 learners, deaf aphasics, and deaf children in research settings, explained the goals, protocol, and potential risks and benefits of the present experiment. She did so face-to-face using simple ASL, gesture, and facial expression (to convey the potential emotions of fear, boredom, or confusion) emphasizing that participant was free to decline or stop the experiment at any time. This explanation included photographs of a person looking at pictures and videos. Throughout this explanation, the research assistant probed the signers for comprehension. After this explanation, each participant stated their willingness to participate in the study through ASL. Their agreement was witnessed by another experimenter also highly proficient

Table 1. Background characteristics of the signers.

	Age at test	AoA*	Years ASL at test	Hearing Loss
Carlos	21	13;8	8	profound
Cody	21	14;8	7	moderate-severe
Martin	52	21	31	profound
Maya	59	16	43	profound
Shawna	22	14;7	8	profound

*Age of acquisition, that is, the age at which ASL exposure began.

in ASL and communicating with late L1 learners. A Deaf signer then interviewed the participants about their background and gave them instructions in ASL about the task. For Carlos, Cody and Shawna we supplemented the interview with information previously obtained from a legal guardian. The study was approved by the Institutional Review Board at the University of California, San Diego (#160361).

The narrative task involved retelling four short stories based on the Balloon Stories (Karmiloff-Smith, 1979). The stories were simple and had been used with deaf signers of different sign languages before (Frederiksen & Mayberry, 2016; Sümer, 2016). We therefore judged them to be appropriate for use with deaf signers who were later learners of ASL as well. Further, our previous use of these stimuli allowed us to make comparisons between two groups of signers. Two of the stories were video-based and two were picture-based stories. The participant sat opposite a Deaf signer who had been exposed to ASL since birth. The participant viewed the stimulus stories on a laptop computer. The screen was only visible to the participant and not to the addressee. The instructions were to tell the addressee, who had not seen the stories, what happened. After watching a story, the participant narrated the events to the addressee. When their narrative was completed, they were shown the next story. The narratives were recorded on a digital video camera. We counter-balanced the order of presentation of the stimulus stories among participants with a Latin squares design.

Transcription and coding

Transcription, annotation, and coding were completed following the protocol described in Frederiksen and Mayberry (2016). The recordings of the participants' narratives were transcribed in ELAN (Crasborn & Sloetjes, 2008) using standard sign glossing conventions (Baker-Shenk & Cokely, 1980), with minor modifications. Excerpt 1 exemplifies our transcription and coding procedures (see additional details in Frederiksen & Mayberry, 2016). Transcriptions and clause annotations were completed by a Deaf signer who had been using ASL since birth, who has had extensive training in ASL transcription, coding, and annotation. The transcriptions were subsequently checked by a -hearing second language learner of ASL (the first author) trained in ASL linguistics, who also completed coding of referring expressions and discourse statuses. Questions and disagreements were resolved through discussion. After transcription, we divided the narratives into clauses and sentences, following R. A. Berman and Slobin's (1994) approach of using the presence of predicates to identify clause boundaries. Sometimes the signers used overlapping signs or constructed action sequences across multiple predicates. In these instances, we looked at whether there were eyeblinks, pauses or lengthened signs that suggested sentence boundaries (Hansen & Hessman, 2007; Wilbur, 1994). If not, then we annotated multiple predicates as belonging to the same sentence. The square brackets in the excerpt exemplify how we annotated sentence boundaries.

Excerpt 1. Excerpt from a Balloon Story.

[GIRL WALK][. . .][CA: NOTICE-SOMETHING]

girl – introducedgirl – maintained

nounzero anaphor from constructed action

[CA: IX:1 REALLY WANTTHATBALLOON] [. . .] [IX:R WOMAN CA:OK]

girl – maintainedballoon – introducedwoman – introduced

zero anaphor from constructed actionnounnoun

[CA: TAKE-BALLOON][CA: THANK-YOU]

girl – reintroducedgirl – maintained

zero anaphor from constructed actionzero anaphor from constructed action

A girl is walking. [...] She notices (something). "I really want that balloon." [...] The woman says ok.



Figure 3. Still images from a stimulus story. From the top left: 1) scene setting, 2) meeting, 3) receive object, 4) leave with object, 5) loss of object, 6) reaction, 7) conclusion.

The girl takes the balloon. (She says) "Thank you"

Story structure

The stimulus stories each contained seven smaller events: 1) scene-setting, 2) the meeting of the protagonist and the secondary character (meeting), 3) the protagonist receiving the central object (receive object), 4) the protagonist leaving with the object (leave with object), 5) the protagonist losing the object (loss of object), 6) the protagonist's reaction to losing the object (reaction), 7) the conclusion of the story (conclusion) (see Figure 3). We assessed how many and which of the events were included in each narrative by determining for each sentence which event(s), if any, it described.

Referring expressions

We also identified each referring expression (any overt or null reference to animate and inanimate entities), and coded which referent the expression denoted. We used this information as well as the sentence boundaries to code the reference status of each referring expression as either introduced, maintained, or reintroduced (Gullberg, 2006; Morgan, 1998). Every first mention of a referent was labeled as introduced. Subsequent mentions were included only when they functioned as sentence subjects, following Gullberg (2006). We coded such expressions as maintained if the same entity had been referenced by any expression, null or overt, in any position in the previous clause. References were coded as reintroduced if they appeared as the clausal subject following a clause where the referent in question was not mentioned.

Each referring expression that was coded with reference status (introduced, maintained, or reintroduced) was additionally labeled by type of expression: noun, classifier, zero anaphor, and

pronoun.² Referring expressions labeled as zero anaphora were further sub-classified as resulting from plain verbs, agreement verbs, or constructed action. Verbs were coded as agreement verbs when they had spatially differentiated starting and ending points indicating verb arguments. Constructed action was identified on the basis of role-shift, that is, the signer shifting the position of their body in space to indicate which entity they were acting as, or on the basis of non-manual marking, that is, if facial expression or eye-gaze indicated that the signer was acting as an entity from the narrative. In cases when more than one type of referring expression occurred simultaneously, we opted to count only one of the types. This happens specifically with constructed action, which is often sustained across multiple predicates. If a lexical plain verb, agreement verb, or classifier predicate that was not considered quotational co-occurred with constructed action, we counted only the predicate. When nominals or pronominals occurred as quotational expressions in contexts of constructed action, as in Excerpt 1, we counted only the constructed action.

For zero anaphora from agreement verbs and constructed action occurring in maintained and reintroduced contexts, we also coded whether the predicate was spatially modified, that is, whether verb movement or orientation was different from the citation form, or whether the signer indicated their engagement in constructed action with physical shifts in hand or body position. Outside of constructed action contexts, we only found one instance of a pronoun across the participants' narratives. The low number of pronouns is in line with Frederiksen and Mayberry (2016), and we thus exclude pronouns from further discussion.

Results

The present study asked three questions about cohesion and coherence when language is first acquired after childhood. We first asked how the participants structure their stories. To answer this, we assessed which of the seven events (see Figure 3) were included in participants' narratives. Table 2 shows how often across the four narratives the late learners included each event, as compared to the mean number from the signers in Frederiksen and Mayberry (2016) who had been exposed to ASL since birth. Carlos, Cody and Maya all included most events in their narratives, except for the meeting of the two characters. Martin omitted nearly every event at least once across his stories, such that nearly a third of the events were omitted across the four narratives. However, many of the excluded events, especially the Meeting event, were not critical to understanding the narrative. Each of Shawna's narratives left out the first four events, excepting one mention of the protagonist receiving the central object. This resulted in more than half the events being omitted across the four stories. The signers from Frederiksen and Mayberry (2016) generally described each event in a story, except the event in which the protagonist meets the secondary character. This event was left out in nearly a third of the narratives in Frederiksen and Mayberry and was also the event most frequently omitted by the late learners. When leaving out this event, the signers in F&M tended to describe the occurrence as the

Table 2. Number of events described across the four stimulus stories.

	Scene -setting	Meeting	Receive object	Leave w. object	Loss of object	Reaction	Conclusion	Total events
Carlos	4	2	4	4	4	4	3	25
Cody	4	2	4	4	4	4	4	26
Martin	3	0	3	4	3	4	3	20
Maya	4	4	4	4	4	4	4	28
Shawna	0	0	1	0	4	4	4	13
F&M2016	3.875	2.75	4	4	4	4	3.875	26.5

²We recognize the inherent contradiction in treating as "expressions" zero anaphora, which by definition do not in fact by themselves express anything. However, for the purposes of understanding referent tracking, zero anaphora are often discussed under the heading of referring expressions (e.g. Debreslioska et al., 2013; Perniss & Özyürek, 2015) and we do so here as well.

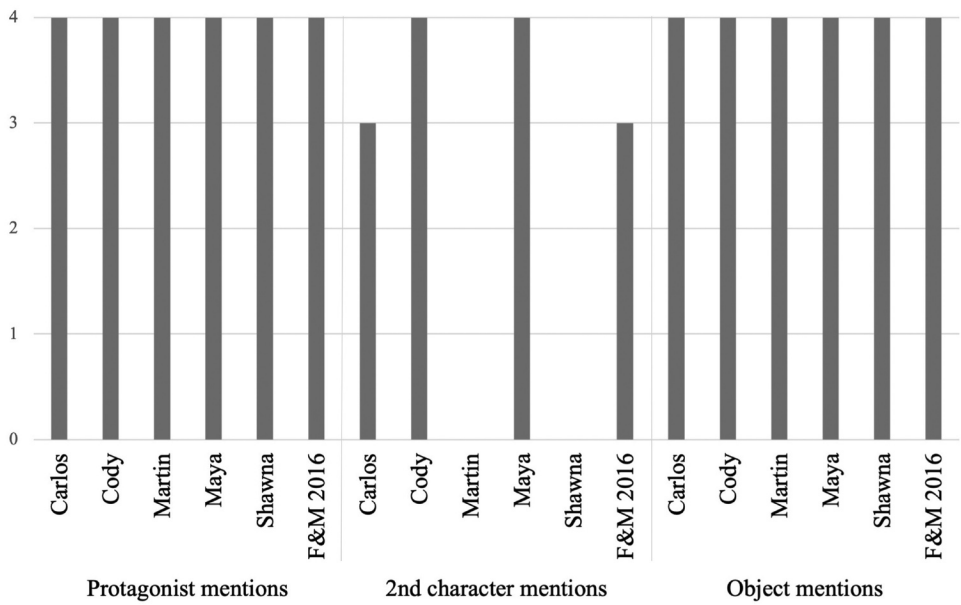


Figure 4. Number of primary discourse entities mentioned across all narratives.

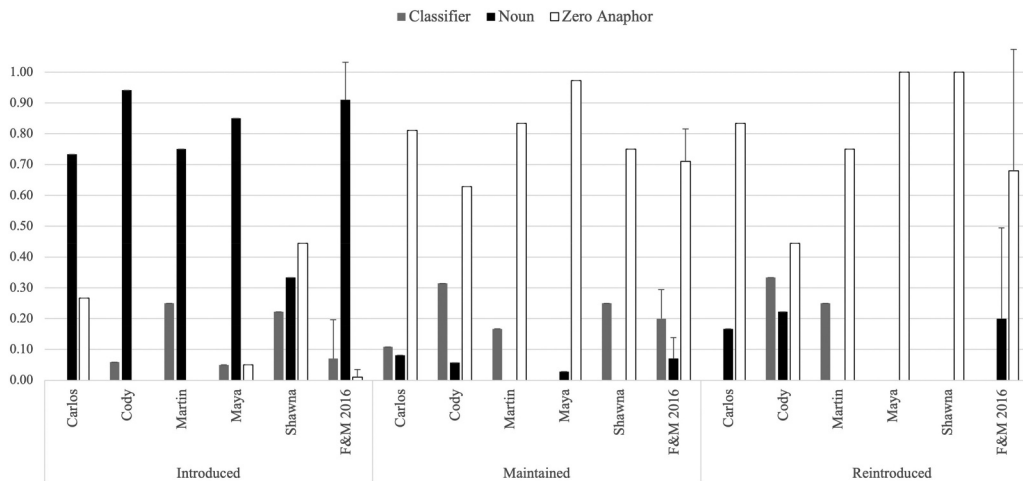
protagonist purchasing the object from a shop or stand, rather than as an exchange between two characters. The late learners tended to describe the event as the protagonist receiving the object, leaving unspecified from where and from whom.

We next asked how learning their first language later in life might affect whether the signers in our sample mention different entities in their ASL narratives. To answer this question, we examined the rate of mentioning the protagonist, the secondary character, and the central object in the narratives (Figure 4). This analysis revealed that the protagonist was always mentioned at least once in each narrative, as was the central object. The secondary character, however, was frequently left out of the story, commensurate with the omission of the “Meeting” event (Table 2). Cody and Maya alone never omitted a secondary character. Carlos omitted the secondary character from one story. Martin’s narratives never included the secondary character. Shawna’s narratives likewise never included the secondary character because her narratives all began at the point where the protagonist loses the central object, at which point the secondary character is no longer relevant to the story. As discussed above, stories such as these can of course be told without explicitly including the secondary character; on average, the signers from Frederiksen and Mayberry (2016) opted for this strategy in one out of four narratives.

Finally, we addressed the question of how the late learners in our sample vary specific referring expressions to reflect the different discourse statuses. We collapsed references to all entities to focus on whether the mention was a first mention (introduction), continued mention (maintained), or a mention after a period of absence from the narrative (re-mention). We analyzed the signers’ use of classifiers, nouns, and zero anaphora in introduced, maintained and reintroduced contexts (Table 3). As shown in Figure 5, the late learners followed varied patterns. Collapsing across the four stories, each learner introduced between 8–20 entities. Except for Shawna, for whom only 33% ($n = 3$) of introductions were nouns, the introductions were primarily accomplished with nouns (74–94%, $n = 6$ –17). The late learners, with the exception of Carlos, also all used some classifiers to introduce (5–25%, $n = 1$ –2). Carlos and Shawna frequently used zero anaphora in introduced contexts; for Shawna, zero anaphor was the primary means of expression in introductions, that is, the type of expression most frequently used to introduce (44%, $n = 4$). For Carlos, it was the secondary means, that is second most frequent type of expression (27%, $n = 4$). By comparison, the signers in F&M

Table 3. Number (proportion) of references as a function of signer, reference category, and discourse status.

	Classifier	Noun	Zero Anaphor
Introduced			
Carlos	0 (0.00)	11 (0.73)	4 (0.27)
Cody	1 (0.06)	16 (0.94)	0 (0.00)
Martin	2 (0.25)	6 (0.75)	0 (0.00)
Maya	1 (0.05)	17 (0.852)	1 (0.051)
Shawna	2 (0.22)	3 (0.33)	4 (0.44)
Maintained			
Carlos	4 (0.11)	3 (0.08)	30 (0.81)
Cody	11 (0.31)	2 (0.06)	24 (0.63)
Martin	5 (0.17)	0 (0.00)	25 (0.83)
Maya	0 (0.00)	2 (0.03)	69 (0.97)
Shawna	4 (0.25)	0 (0.00)	12 (0.75)
Reintroduced			
Carlos	0 (0.00)	1 (0.17)	5 (0.83)
Cody	3 (0.33)	2 (0.22)	4 (0.44)
Martin	1 (0.25)	0 (0.00)	3 (0.75)
Maya	0 (0.00)	0 (0.00)	5 (1.00)
Shawna	0 (0.00)	0 (0.00)	3 (1.00)

**Figure 5.** Proportion of references by signer, reference category, and discourse status.

introduced with nouns (91% on average, $n = 6-17$) and most used a small proportion of classifiers (7% on average, $n = 0-3$).

Referent maintenance was more frequent than introduction or reintroduction. The five signers produced between 16–71 maintained references across the four stories. They all used zero anaphora as the primary means of maintaining reference (63–97%, $n = 12-69$), and most used a small number of classifiers as well. Compared with the signers in Frederiksen and Mayberry (2016), who used primarily zero anaphora (71%, $n = 22-38$), some classifiers (20%, $n = 2-13$), and a small proportion of nouns (7%, $n = 0-10$), Maya used zero anaphora at a very high rate (97%, $n = 69$), both numerically and proportionally. Carlos, Martin and Shawna used classifiers in proportions that were relatively similar to the signers in Frederiksen and Mayberry (2016) (11–25%, $n = 4-5$ vs. 20%, $n = 2-13$). However, Cody used a noticeably large proportion of classifiers (31%, $n = 11$), although his classifier count falls within the numerical range of variation of the signers in Frederiksen and Mayberry (2016). Maya used no classifiers at all in this context. Carlos, Cody, and Maya all used a small proportion of nouns to

Table 4. Number (proportion) of spatially modulated expressions out of all agreement verbs + constructed action tokens in maintained and reintroduced contexts.

	Spatially modulated out of all maintained agreement verbs + constructed action tokens	Spatially modulated out of all reintroduced agreement verbs + constructed action tokens
Carlos	4 (0.24)	0 (0.00)
Cody	0 (0.00)	0 (0.00)
Martin	0 (0.00)	0 (0.00)
Maya	16 (0.29)	1 (0.33)
Shawna	0 (0.00)	0 (0.00)
F&M2016	61 (0.61)	10 (0.59)

maintain (3–8%, $n = 2-3$). Martin and Shawna, like some of the signers in Frederiksen and Mayberry (2016) never used nouns.

Reintroductions were infrequent in the present data, as in Frederiksen and Mayberry (2016), most likely as a function of the stimulus materials. The signers in the present study each produced between 3–9 reintroductions (compared to 0–10 each in Frederiksen & Mayberry, 2016). The reintroductions had zero anaphora as the primary means of expression (44–100%, $n = 3-5$). As in maintained contexts, Martin and Shawna never used nouns. Maya likewise did not use nouns in reintroduced contexts. Some of the signers in Frederiksen and Mayberry (2016) also did not use nouns. Carlos and Cody both used nouns (17–22%, $n = 1-2$). Cody and Martin both used a relatively large proportion of classifiers in this context (25–33%, $n = 1-3$). The signers in Frederiksen and Mayberry (2016) used zero anaphora (68%, $n = 0-5$) and nouns (20%, $n = 0-5$). Note, however, that the low overall number of reintroductions limits the generalizations that can be drawn about this context (see Table 3). In addition, the structure of the stimulus stories in the present study meant that many reintroductions occurred when the protagonist was re-mentioned immediately after a clause in which the inanimate object was in focus. As will be discussed in section 6.2, the demands for specificity may differ for reintroduction following inanimate vs. animate entities.

To answer whether late first language learning affects use of morphosyntactic marking to indicate maintained and reintroduced reference, we further examined the use of spatial modulation in the signers’ narratives. We collapsed referring expressions labeled as zero anaphora from agreement verbs and constructed action and examined how many of these expressions were spatially modulated out of the total number of tokens from zero anaphora from agreement verbs and constructed action in each discourse status. This analysis revealed that among the late learners, only Carlos and Maya used spatial modulation (Table 4). Cody, Martin, and Shawna never used spatial marking on their agreement verbs and constructed action. Carlos used spatial modulation in maintained (24%, $n = 4$) but not in reintroduced contexts. Maya used spatial modulation in both maintained (29%, $n = 15$) and reintroduced contexts (33%, $n = 1$). By comparison, the signers in Frederiksen and Mayberry (2016) favored spatially modulating zero anaphora both in maintained (61%, $n = 3-13$) and reintroduced contexts (59%, $n = 1-8$).

To summarize, Carlos, Cody, and Maya consistently included almost every story event, while Martin and Shawna left out 8 and 15 events (29–54%), respectively, across the four narratives. The late learners’ narratives always mentioned the protagonist and the central object, but frequently left out the secondary character. Cody’s, Martin’s, and Maya’s uses of primarily nominal referring expressions in introduction contexts looked very similar to the signers in Frederiksen and Mayberry (2016) while Carlos and Shawna frequently selected underspecified forms, such as zero anaphora. In maintained and reintroduced contexts, each late learner preferred zero anaphora for reference. For reintroductions, Carlos’ proportions of zero anaphora and nouns were like the signers in Frederiksen and Mayberry (2016). Also like some of the signers in Frederiksen and Mayberry (2016), Maya, Martin, and Shawna never used nouns to reintroduce. Cody and Martin differed from the pattern in Frederiksen and Mayberry (2016) by using classifiers to reintroduce. Finally, the late learners’ narratives were categorized by the absence or low frequency of spatial marking on agreement verbs and constructed action.

Discussion

The present study examined cohesion and coherence in the narratives of individuals who began learning ASL as their first language in adolescence. We asked whether the signers' narratives would include the information necessary for the integrity of the story structure, and whether they would vary referring expressions and morphosyntactic marking as a function of referential status similarly to signers exposed to ASL from birth. While the small sample size in the present study limits our ability to generalize, the results indicate areas of discourse competence that may be fruitful for future additional studies. From the traditional point of view (i.e. treating language use by individuals who learned the language from birth as the benchmark), an assumption that narratives are resilient to age of acquisition effects even when language acquisition begins in adolescence, leads to the expectation that the learners should pattern similarly to individuals exposed to a sign language from birth or early childhood. As will be elaborated below, our findings show story structure and reference selection that is overall pragmatically appropriate. If narrative competence is construed as producing a comprehensible story, then the late learning signers in our study were, for the most part, successful. It is noteworthy, however, that we found large individual differences, even among the learners that are similar in terms of age of acquisition and length of experience. While some of this variation does not result in differences in pragmatic appropriateness, other variation results in incomplete story structures and underspecified referent tracking that may not be sensitive to the needs of the addressee. This suggests that the challenges observed in late language learners on other linguistic levels may also extend to the narrative domain, and that learning language late may result in individual differences in combining lexical, grammatical, and pragmatic skills. Our analysis of spatial marking further suggests that late learners' morpho-syntactic abilities may not suffice to accomplish appropriate referent tracking in more complex narratives.

Story structure

Examining coherence in the narratives, we found that the late learners included most of the story events in their narrative. Previous work has suggested that children exposed to sign language from birth do not yet perform scene-setting like mature language users do, and that they include progressively more event descriptions with age and with corresponding increases in pragmatic awareness (Morgan, 1998, 2005; Sümer, 2016). All but one of the late learners in the present study included most events across the four narratives. Omitted events, such as the meeting of the protagonist and the secondary character, were generally not those most crucial to the integrity of the story structure. The late learners in the present study also consistently included mentions of the protagonist and the central object. However, consistent with the omission of the meeting event, the secondary character was frequently left out. Overall, the structure in the late learners' narratives suggests that they possess the pragmatic awareness necessary to provide sufficient information for understanding the stories. Previous research with homesigners has suggested that story organization might be dissociated to some degree from linguistic ability (Van Deusen-Phillips et al., 2001). In line with previous studies suggesting that narrative ability is resilient in childhood first language learners (Gür & Sümer, 2022; Keleş et al., 2023), the results of the present study show pragmatic awareness can be also employed in the context of using a conventional language, even when language exposure first began in adolescence. The exception to the pattern of clear pragmatic awareness was Shawna's narratives which left out between three and four events out of the first four events, and correspondingly never mentioned the secondary character. It is not clear why Shawna's results are so different from the other participants. One possibility is that Shawna did not understand the task instructions. As reported in Ferjan Ramirez et al. (2014), Shawna completed a test of non-linguistic intelligence shortly after beginning to learn ASL. The results of this test fell well below the mean, but this should be interpreted with caution as non-

verbal intelligence scores often start low and then show significant improvement in individuals with atypical early education experiences (Mayberry, 2002; Morford, 2003). If the results of the present study cannot be attributed to differences in cognition not directly related to language, the variability in the late learners' story structure might instead suggest that the highly variable performance and acquisition trajectories in late first language learners reported by previous research (Morford, 2003; Newport, 1990) extends to the development of pragmatic abilities.

Cohesion

Our analyses of cohesion suggest that, at the global level, most of the late learners in the sample display the pragmatic awareness necessary to select appropriately specific referring expressions in simple narratives, again with appropriateness being construed based on the signers in Frederiksen and Mayberry (2016). With the exception of Shawna's referent introductions, the primary means of reference, that is the type of referring expression the late learners use the most for introduction, maintenance, and reintroduction respectively, match the preferences identified in previous research with Deaf adult signers exposed to a sign language from birth (Ferrara et al., 2022; Frederiksen & Mayberry, 2016; Hodge et al., 2019; Keleş et al., 2023; Morgan, 1998; Swabey, 2011). Introductions are achieved with nouns, which are explicit referring expressions, and maintained and reintroduced references are achieved with zero anaphora, which are reduced referring expressions.

Beyond the primary referring expression in each discourse status, however, we find differences in the selection of less frequently used referring expressions, which we will refer to as secondary means of reference. In introduction contexts, the signers in Frederiksen and Mayberry (2016) used a very small proportion of classifiers. In the present study, we found that Cody and Maya similarly used a small proportion of classifiers, however, Martin, Shawna, and Carlos introduced in ways that could be considered underspecified. A quarter of Martin's introductions were accomplished with classifiers, which typically require introduction with a noun first. Carlos and Shawna frequently used zero anaphora to introduce, which are also not sufficiently explicit for this purpose. In Shawna's narratives in particular, the lack of an overt labeling of the protagonist combined with the omission of the secondary character is likely to cause comprehension difficulties for the addressee. Thus, while the primary means of reference is generally pragmatically appropriate in the late learners, there is more variation and also underspecificity in the secondary means of reference. This is similar to what has been observed in young Deaf signing children (Morgan, 1998) and suggests that while late learners clearly display sensitivity to pragmatics, their abilities in this domain may not extend to the more fine-grained selection of referring expressions. We further note that although Gür and Sümer's (2022) findings did not reach statistical significance, the late learners in their study in fact used similar proportions of nouns and constructed action to introduce referents, suggesting insufficient specificity in many cases of referent introduction. Numerically, this result is in line with the underspecificity displayed by Carlos's, Shawna's, and Martin's referent introductions in the present study. In maintained and reintroduced contexts, the late learners were more similar as a group as well as to previous findings with individuals exposed to a sign language from birth. In maintained contexts, the late learners used primarily zero anaphora and secondarily a small proportion of nouns and/or classifiers in patterns similar to Frederiksen and Mayberry (2016). None of the signers showed evidence of over-specificity, something that characterized maintained contexts in the youngest children's narratives in the study by Morgan (1998), as well as the late T1D learners in the study by Keleş et al. (2023). Studies of speech-speech bilinguals (e.g. Gullberg, 2003; Sorace & Filiaci, 2006) have similarly found overexplicitness to be characteristic of reference in the weaker language, and the same has been shown for sign-speech bilinguals (Reynolds, 2018; but see also Frederiksen & Mayberry, 2018). The reason for these different findings is not clear but may have to do with the simple stimulus stories used in the present study. As will be discussed below, it is possible that using more complex stimulus stories than

we did here will reveal overexplicitness in adolescent ASL learners as well. Reintroduced contexts were characterized by use of zero anaphora only or zero anaphora and nouns, similar to the signers in Frederiksen and Mayberry (2016), though Cody and Martin also used classifiers. The use of zero anaphora in reintroduction contexts is perhaps surprising, as it raises the question of how the addressee knows to which entity to attribute the described content. In the stimulus materials of the present study, the role of the secondary character was minor and restricted to the beginning of the story. Because of this, many instances of reintroductions were of the primary character after a clause focused on the inanimate object. Constructed action is unlikely to be used for representing inanimate entities; in the present study, therefore, many of these uses of zero anaphora are not likely to cause confusion for the addressee, as they will be linked to the primary character without difficulty. Based on these results, we cannot make claims about how late learners use referring expressions in stories requiring maintenance and reintroduction of several animate characters. However, the results from a study by Ferrara and colleagues of fluent signers' retellings of *Frog, Where Are You?* (Mayer, 1969) in five sign languages suggest that use of constructed action is common in reintroductions in narratives even when they involve additional animate entities (Ferrara et al., 2022). Future studies of late first language learners should confirm the use of zero anaphora in reintroduction contexts with a larger group of participants and further investigate how this may interact with the use of spatial marking as also discussed below.

Classifiers

Previous research has found that young children learning a sign language from birth overuse underspecified classifiers for referent introductions and underuse classifiers for maintained reference (Morgan, 2005). In the present study, there was no evidence of the late learners underusing classifiers. This facility with classifiers aligns with findings from the two adolescent first language learners studied by Morford (2003), Marcus and Maria (see also Ferjan Ramirez et al., 2014). Marcus and Maria were observed producing classifiers after only 7 and 15 months of ASL exposure, long before using morphology such as verb agreement. Thus, while classifiers are often considered morphologically complex, the results of the present study support previous findings suggesting that late learners use classifiers without particular difficulty. Here, we even find evidence that Martin, Shawna, and Cody in fact overused classifiers in introduction and/or reintroduction contexts. Thus, the present results suggest that the late learners' abilities with classifiers may not extend to the pragmatically appropriate use of classifiers for referent tracking. Future studies may want to investigate whether narrative complexity affects the use of classifiers in learners with impoverished childhood language input.

Morphosyntactic marking

Given previous findings that complex morphosyntax poses a challenge in late first language acquisition, an important question is whether and how late learners utilize grammatical marking in the context of cohesion. Here, we focused on spatial marking on agreement verbs and constructed action to address this question.

The learners in the present study all used agreement verbs but tended to use them in their citation form without spatial inflection, which is similar to what has been reported for young children (Meier, 1982). Similar to their use of agreement verbs, the late learners used constructed action for the purpose of tracking reference, but they generally did so without changing the position of body or hands in space to indicate which character they were acting as. Carlos and Maya alone used spatial modification in the narratives.

Overall, these results are in line with previous findings about verb agreement, constructed action, and the use of spatial modulation. Most studies have shown that processing of verb agreement is difficult for later first language learners (Boudreault & Mayberry, 2006; Emmorey et al., 1995; Morford, 2003), although Mayberry et al. (2023) found that the majority of the late learners in their study showed significant comprehension of verb agreement. Studies focused on the production of verb

agreement have shown that agreement verbs appear relatively early on in language development (Morford, 2003), but that the marking of agreement on such verbs is error-prone (Berk, 2003). Studies examining constructed action in late learners are rare. Cormier et al.'s (2013) investigation of the framing of constructed action found no effects of age of first language acquisition but did not include the use of spatial marking. Young Deaf children begin using constructed action relatively early but initially mark it with eye-gaze and facial expression only, and evidence from the evolution of Nicaraguan Sign Language further suggests that use of constructed action without spatial marking can be considered a basic representation (Kocab et al., 2015). This would suggest that the use of constructed action by late learners in the present study may represent an early-emerging form.

The late learners' limited use of spatial marking may seem surprising in comparison with the results of Mayberry et al. (2023) where the late learners' mean accuracy was 75% on a task measuring comprehension of verb agreement. In the present study, three of the five signers produced no spatial modification at all, and the two who did produce it did so at a much lower rate than 75%. A possible explanation for the difference is that the stimuli in the present study were simple by design and the resulting narratives were simple as well. It is possible that the late learners' limited use of spatial marking occurred because there was little need to differentiate between characters in the simple stories. This possibility, however, does not explain why the signers in Frederiksen and Mayberry (2016) did not similarly reduce the amount of spatial marking in their narratives. Thus, a more plausible explanation is that the late learners' facility with spatial marking on the sentence level differs based on the demands of a narrative context. This parallels the observation from child language research that children are unaware of the pragmatic demands of a previously acquired linguistic form when using it on the discourse level (R. A. Berman, 1988). In addition, Morford (2003) showed that task demands affect how late learners employ their morpho-syntactic abilities. While the stories in the present study were simple, they were novel to the participants and were only shown once. The method used in the present study may have sufficiently increased the demands of the task and caused the late learners in the present study to use less spatial marking than they may be able to in other contexts. Overall, the learners' generally limited use of spatial modulation in simple narrative indicates potential difficulty in more complex narratives. The stories in the present study involved at most two animate characters with limited interaction and thus allow referent maintenance and reintroduction with zero anaphora without spatial marking. In more complex narratives, spatial marking may help to disambiguate multiple referents while still allowing for maintained and reintroduced reference to be accomplished with less explicit forms. Future research should directly compare the difference between verb agreement making on the sentence vs. discourse-levels³ and investigate the possibility of less pragmatically appropriate referent tracking when late learners produce more complex narratives.

Conclusion

The present study investigated story structure and referent tracking in individuals who learned American Sign Language (ASL) as their first language in adolescence. Evidence from previous studies has suggested resilience to age of acquisition effects in childhood sign language learners' narrative skills. In the present study, we find mixed evidence for such resilience. While some of the late language learners in the present study used story structure and referent tracking similar to what has been reported in signers exposed to sign language from birth, the narratives of other late learners left out necessary pieces of information and did not always appropriately vary the explicitness of referring expressions. While the small sample size in the present study limits our ability to draw broad conclusions, the results of the present study suggest that the broad resilience of the narrative domain found in previous studies may not extend to cases where language is first acquired in adolescence, and that additional studies are needed to better understand the effects of age of (conventional) language acquisition on narratives and discourse ability more broadly.

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Data availability statement

The quantitative, anonymized data that support the findings of this study are available from the corresponding author, ATF, upon reasonable request.

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