Linguistic markers of specific language impairment in bilingual children: The case of verb morphology

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Abstract
This study investigates verbal morphology in Specific Language Impairment (SLI) in German, focusing on past participle inflection. Longitudinal data from 12 German-speaking children with SLI, six monolingual and six Turkish–German sequential bilingual children, were examined, plus an additional group of six typically developing Turkish–German sequential bilingual children. In a recent study (Rothweiler, M., Chilla, S., & H. Clahsen. (2012). Subject verb agreement in Specific Language Impairment: A study of monolingual and bilingual German-speaking children. Bilingualism: Language and Cognition, 15, 39–57), the same children with SLI were found to be severely impaired in reliably producing correct agreement-marked verb forms. By contrast, the new results reported in this study show that both the monolingual and the bilingual children with SLI produce participle inflection according to their language age. Our results strengthen the case of difficulties with agreement as a linguistic marker of SLI in German and show that it is possible to identify SLI from an early sequential bilingual child’s performance in one of her two languages.

Keywords: Bilingualism, German, morphology, SLI, Turkish

Introduction
Specific Language Impairment (SLI) has been taken to be language impairment for no apparent reason, i.e. a delay and/or disorder of the normal acquisition of language in the absence of neurological trauma, cognitive impairment, psycho-emotional disturbance or motor-articulatory disorders (Leonard, 1998; Levy & Kavé, 1999). Much recent research has focused on demonstrating that SLI is not as “specific” as originally thought and that in addition to language impairments, children with SLI have multiple non-linguistic difficulties in the domains of speech perception skills, working memory, attention and executive control and reading skills (e.g. Archibald & Gathercole, 2006; Joanisse & Seidenberg, 2003; Miller, Kail, Leonard, & Tomblin, 2001; Norbury, Bishop, & Briscoe, 2002; Schwartz, 2009). However, despite the recent
interest in comorbidity with non-linguistic skills, it is still the case that what is common to children with SLI and what defines the phenotype are impairments in the domain of language. Linguistic studies of SLI should contribute to better understand the nature of these impairments, first, from a purely descriptive perspective, by providing precise characterizations of language impairments and perhaps even linguistic markers of SLI, and second, by discovering potential within-language dissociations in children with SLI, i.e. their strengths and weaknesses in different domains of language; see Clahsen (2008) for further elaboration.

For monolingual children, linguistic markers of SLI have been identified for a number of languages. The most widely known case is the proposal that difficulties with tense marking constitute a clinical marker for SLI in English (Rice, 2003; Rice & Wexler, 1996). Rice (2003) reported a selective delay of the development of tense markers in monolingual English-speaking children with SLI compared to unimpaired children. Although grammatical morphemes such as the plural –s develop within normal limits, English-speaking children with SLI start using tense markers at a later age than unimpaired children. Moreover, even after several years of exposure, they do not achieve the same high accuracy scores as unimpaired children. For monolingual German-speaking children with SLI, subject–verb agreement has been found to cause difficulty, even for children for whom tense marking or case marking functions normally (e.g. Bartke, 1998; Clahsen, Bartke, & Goellner, 1997; Eisenbeiss, Bartke, & Clahsen, 2005). For French, Italian and other Romance languages as well as for Greek, selective difficulties with (object) clitic marking have been proposed as a marker of SLI in monolingual children (e.g. Bortolini et al., 2006; Jakubowicz, 2003; Tsimpli, 2001).

Much less is known about linguistic markers of SLI in bilingual children. Bilingual language development is affected by age of acquisition, amount of input/intake and social context. Sequential bilinguals, for example, people who begin to learn another language after their first language, have been reported to follow developmental trajectories different from those of monolingual children, particularly when the second language has been acquired in late child or adulthood (e.g. Chilla, 2008; Meisel, 2009). It is therefore conceivable that SLI in sequential bilinguals exhibits different linguistic characteristics from those of monolingual children or from bilingual children who have acquired more than one language simultaneously.

The current study examines phenomena in the domain of verb morphology as potential linguistic markers of SLI in the German of early sequential bilingual children (L1: Turkish and L2: German). This group of children (henceforth dubbed “SLI-L2”) was independently diagnosed with SLI in both their L1 and their L2. Turkish – the first language of the children studied here – is an agglutinative language with rich verbal morphology. Verbs may not only be morphologically marked for person and number but also for tense and aspect, for voice, mood and other morphosyntactic features. Chilla and Babur (2010) have reported that Turkish–German children with SLI produce sentences with incorrect verb inflection in their Turkish, particularly with respect to person and number marking. For this study, we compared a group of (Turkish/German) SLI-L2 children to two control groups, first, a group of typically developing early sequential bilingual children from the same population as those with SLI (TD-L2), and second, a group of monolingual German-speaking children with SLI (SLI-L1) that was closely matched to the experimental group on both linguistic and non-linguistic criteria. In an earlier study on this population of sequential bilingual children with Turkish/L1 and German/L2, Rothweiler, Chilla, & Clahsen (2012) examined subject–verb agreement and found impairments in this domain for the SLI-L2 group that were parallel to those of a control group of monolingual German-speaking children with SLI. Consequently, Rothweiler et al. (2012) argued that difficulties with subject–verb agreement constitute a marker of SLI in German, for both monolingual and (early sequential) bilingual children.
In this study, we examine whether the reported difficulties with subject–verb agreement in German SLI extend to a different domain of verbal morphology, past participle inflection. To preview the findings, our results show that despite impaired subject–verb agreement, participle formation is unaffected in German-speaking children with SLI, both in monolingual and bilingual ones, and corresponds to a child’s general level of language development. These results, we argue, strengthen the case for subject–verb agreement as a specific linguistic marker of SLI in German.

Inflectional morphology in bilingual language development

Much previous research on bilingualism and bilingual language development has focused on vocabulary and the lexicon investigating simplex rather than morphologically complex words. One prominent idea is the so-called “weaker links hypothesis” (Gollan, Montoya, Cera, & Sandoval, 2008) according to which the bilingual lexicon has weaker links between form and meaning than the monolingual one, because frequency-of-use needs to be divided between two languages. Assuming that words that are produced more often are easier to produce, this will lead to a bilingual disadvantage in language production. As frequency of use also affects the production of morphologically complex words, this hypothesis may also apply to inflected and derived words.

There is also a number of studies that examined grammatical phenomena in sequential bilingual children (TD-L2), the results of which are controversially interpreted. Schwartz (2004: 121) claimed that inflectional morphology in TD-L2 children patterns with L1 development and does not cause particular acquisition problems for these children, unlike for adult L2 learners. In line with this, Sterner (2013) found that past participle inflection of German does not cause particular learning difficulties for a group of TD-L2 children who began to learn the L2 early (at around 3;0). While Rothweiler (2006) and Kroffke and Rothweiler (2006) also reported successful acquisition of inflectional phenomena for TD-L2 children with an early onset of the L2, they also found that this is not the case for children who started later with the L2 (at around 6;0 years); these children produced the same inflectional errors that have been reported for adult L2 learners. Meisel (2009: 214f.) also points to a number of studies that reported persistent difficulties and delays in TD-L2 children’s acquisition of inflectional morphology, even at a relatively advanced stage of their development of syntax (Hulk & Cornips, 2006; Sopata, 2011; Thoma & Tracy, 2006). If inflectional morphology does indeed cause acquisition problems for TD-L2 children, we may expect these difficulties to also affect SLI-L2 children.

Previous studies investigating inflectional morphology in SLI-L2 children have not yet produced a conclusive picture. Some studies found that SLI-L2 children performed considerably worse than corresponding monolingual ones, for example, on plural agreement in Greek (Stavrakaki, Vogindroukas, Chelas, & Ghousi, 2008) and on plural and participle inflection (Steenge, 2006) as well as on gender agreement in Dutch (Orgassa & Weerman, 2008). Other studies reported parallel patterns of impairment for SLI-L2 children and for monolingual controls with SLI, for example, “extended optional infinitives” in English (Paradis, 2008), elevated proportions of inflectional substitution errors in Hebrew (Armon-Lotem, Galit, Siege-Haddad, & Walters, 2008; Dromi, Leonard, Adam, & Zadunaïsky-Ehrlich, 1999) or impaired subject–verb agreement marking in German (Chilla, 2008; Rothweiler et al., 2012). Let us consider the results from this latter study in some more detail as it looked at children from the same group of (Turkish/ L1 and German/L2) SLI-L2 children who were examined for the present study. Rothweiler et al. (2012) investigating the German of 14 children with SLI (seven SLI-L1 and seven SLI-L2) – found impaired subject–verb agreement marking despite an otherwise advanced level of grammatical development in these children. Accuracy scores for obligatory subject–verb
agreement affixes were low (between 45% and 65%), children often produced non-finite verb forms instead, and in 10% to 20% of cases, they even produced agreement substitution errors. In contrast to that, the same children produced wh-questions with overt wh-elements and embedded clauses with overt complementizers indicating an advanced level of development in other domains of their grammar of German. This was the case for both SLI-L1 and SLI-L2 children, which led Rothweiler et al. (2012) to conclude that difficulties with (subject–verb) agreement constitute a marker of grammatical difficulties in German SLI, for both groups of children. Finally, Rothweiler et al. (2012) argued that this impairment does not extend to tense marking, i.e. the present vs. the preterit tense of German. They found that in present-tense contexts, both the SLI-L2 and the SLI-L1 children produced present-tense forms only and no single preterit form, and vice versa in past-tense contexts. Note, however, that in spoken German, past-time reference is normally encoded through a composite form, i.e. an auxiliary plus a participle, and that contexts for true preterit tense were rare in Rothweiler et al.’s samples. Furthermore, German does not have any overt affixes encoding present tense and employs the unmarked stem in the present-tense forms of most lexical verbs. Hence, the reported lack of tense-marking errors in these data does not rule out the possibility that German-speaking children with SLI are impaired not only with respect to subject–verb agreement but also in other areas of inflectional morphology. Further research is needed to examine this possibility, particularly with respect to SLI-L2 children.

The present study

This study is meant to contribute to the identification of linguistic markers of SLI in bilingual children. To this end, we report results from a study of verbal morphology in a group of Turkish/L1 and German/L2 early sequential bilingual children with SLI. As mentioned above, subject–verb agreement was found not to function reliably in these children’s German (Rothweiler et al., 2012). This study examines whether this is a selective impairment or whether other areas of inflectional morphology are also affected. The particular case we looked at is German past participle inflection, a domain of verbal morphology that does not encode any kind of grammatical agreement between different constituents. Every past-participle form in German has one of two endings, –t and –n. The –t participle suffix is highly productive and, like the English past-tense suffix –ed, readily applies to novel verbs (Clahsen, 1997), irrespective of whether they are similar to existing verbs. By contrast, verbs that take –n participles represent a lexically restricted closed class of items, and –n participle formation only generalizes to novel words that are similar to existing verbs (Weyerts & Clahsen, 1994). Regular so-called ‘‘weak’’ participle forms are suffixed with –t and do not exhibit any stem changes (e.g. kaufen – gekauft ‘‘to buy – bought’’), whereas irregular so-called strong forms have the ending –n and sometimes but not always undergo (phonologically unpredictable) stem changes, e.g. gehen – gegangen ‘‘to go – gone’’, schlafen – geschlafen ‘‘to sleep – slept’’. There is also a small group of 13 verbs that have participle forms with stem changes and –t affixation (e.g. bringen/gebracht ‘‘to bring’’, denken/gedacht ‘‘to think’’, nennen/genannt ‘‘to name’’, brennen/gebrannt ‘‘to burn’’). Finally, participles carry the prefix ge– if the stem is stressed on the first syllable. The prefix is not inserted when stress occurs on another syllable, e.g. verlaufen – verlaufen ‘‘to go astray – gone astray’’. Linguists have proposed different representations for –t and –n participles; see Clahsen (1999) for review. Participles with –t are claimed to be formed by an affixation rule (add –t) that applies to any element of the syntactic category [+verb], irrespective of its phonological or semantic properties, and computes a corresponding participle form as its output. Irregular participle forms, i.e. those with –n, on the other hand, are said to be stored as entries in lexical memory.
From the perspective of an agreement deficit in German SLI, we would expect past participles not to be affected in SLI-L2 children. If this is correct, the same bilingual children with SLI that Rothweiler et al. (2012) reported to be impaired with respect to subject–verb agreement should be unimpaired in participle formation. If, on the other hand, inflectional morphology is affected more widely in SLI-L2 children, they may experience concurrent difficulties in producing correct participle forms. In addition, the results of this study also help to assess whether the idea that a bilingual’s lexicon comprises ‘weaker links’ (Gollan et al., 2008) applies to inflected words. If this is the case, we would expect that bilingual children are disadvantaged in producing participle forms relative to their monolingual peers.

Methods

Participants

Spoken production data from 18 children were examined. Twelve children were so-called ‘sequential bilinguals’, i.e. Turkish–German children who acquired Turkish from birth and German as a second language in childhood, six of them typically developing (TD-L2) and six with SLI (SLI-L2). Six participants were monolingual German-speaking children with SLI (SLI-L1). The children with SLI were all boys. Table 1 provides an overview of the data.

The SLI-L1 participants’ chronological ages ranged from 4;8 years (first recording of the youngest child) to 7;11 years (final recording of the oldest child), and their MLU scores, M(ean)L(ength) of U(tterance) calculated in words, from 2.3 to 4.1. All children attended special language therapy classes and/or received individual language therapy. They were independently diagnosed by speech therapists as having SLI. Whilst they demonstrated impairments in clinical tests of language abilities, they did not show any obvious non-linguistic deficits. According to the clinicians’ reports, their non-verbal cognitive abilities fell within the normal limits for their chronological age, there were no reported hearing losses, obvious neurological dysfunctions or

<table>
<thead>
<tr>
<th>Participant group</th>
<th>Name of the child*</th>
<th>Number of recordings</th>
<th>Chronological age</th>
<th>MLU (in words)</th>
<th>Age of onset of L2</th>
<th>L2 exposure (in months)</th>
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<tbody>
<tr>
<td>TD-L2</td>
<td>Faruk</td>
<td>6</td>
<td>3:6–4:10</td>
<td>2.6–4.2</td>
<td>2.9</td>
<td>8–24</td>
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<tr>
<td>TD-L2</td>
<td>Gül</td>
<td>4</td>
<td>4:3–5:7</td>
<td>2.3–3.6</td>
<td>3.0</td>
<td>14–30</td>
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<tr>
<td>TD-L2</td>
<td>Eser</td>
<td>6</td>
<td>3:9–5:6</td>
<td>3.1–4.3</td>
<td>3.0</td>
<td>9–30</td>
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<td>TD-L2</td>
<td>Fikret</td>
<td>4</td>
<td>5:6–6:8</td>
<td>2.8–3.4</td>
<td>4.2</td>
<td>15–29</td>
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<td>TD-L2</td>
<td>Hande</td>
<td>3</td>
<td>4:4–4:11</td>
<td>2.8–3.6</td>
<td>3.4</td>
<td>11–18</td>
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<td>TD-L2</td>
<td>Meral</td>
<td>4</td>
<td>5:2–5:9</td>
<td>2.8–3.2</td>
<td>4.4</td>
<td>9–16</td>
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<tr>
<td>SLI-L2</td>
<td>Arda</td>
<td>4</td>
<td>5:1–6:8</td>
<td>2.7–3.5</td>
<td>3.7</td>
<td>16–36</td>
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<td>SLI-L2</td>
<td>Devran</td>
<td>6</td>
<td>4:4–5:1</td>
<td>2.5–3.2</td>
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<td>SLI-L2</td>
<td>Erbek</td>
<td>5</td>
<td>4:9–6:5</td>
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<td>SLI-L2</td>
<td>Ferdi</td>
<td>3</td>
<td>6:8–6:10</td>
<td>2.3–2.4</td>
<td>4.3</td>
<td>28–31</td>
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<td>SLI-L2</td>
<td>Rasim</td>
<td>7</td>
<td>5:0–5:7</td>
<td>2.5–3.3</td>
<td>3.0</td>
<td>23–30</td>
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<td>SLI-L2</td>
<td>Sadi</td>
<td>2</td>
<td>7:5–7:9</td>
<td>2.0–2.8</td>
<td>2.11</td>
<td>53–57</td>
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<tr>
<td>SLI-L1</td>
<td>Dieter</td>
<td>5</td>
<td>6:0–7:2</td>
<td>2.8–3.6</td>
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<tr>
<td>SLI-L1</td>
<td>David</td>
<td>2</td>
<td>6:11–7:11</td>
<td>3.1–4.1</td>
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<td>SLI-L1</td>
<td>Josef</td>
<td>3</td>
<td>6:8–7:8</td>
<td>2.9–3.1</td>
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<td>Sebastian</td>
<td>5</td>
<td>5:4–6:6</td>
<td>2.7–3.5</td>
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<td>SLI-L1</td>
<td>Benjamin</td>
<td>5</td>
<td>6:6–7:7</td>
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<td>SLI-L1</td>
<td>Stefan</td>
<td>2</td>
<td>4:8–6:4</td>
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*Note that these are not the children’s real names.
motor deficits; see Bartke (1998) for more information. The six SLI-L1 children were selected from a larger sample of 19 children (Rothweiler & Clahsen, 1994), because their grammatical development was more advanced and their production data included subordinate clauses and/or wh–questions from the first recording onwards. The same selection criteria were applied to the 12 bilingual children, the data of whom were taken from a sample of 24 children with Turkish as L1 and a mean age of onset of 3;8 (SD: 0.90) years for German (Rothweiler, 2006), in that all of these 12 children consistently produced subordinate clauses and/or wh–questions. The children in the SLI-L2 were independently diagnosed with SLI in both their Turkish and their German (Rothweiler, Chilla, & Babur, 2010). The assessment of Turkish L1 was based on family interviews, a reconstruction of the development in the L1 (e.g. with respect to criteria for late talkers), and on results from tests of expressive and receptive language abilities in Turkish, such as the T-SALT test (Acarlar, Miller, & Johnston, 2006); see Chilla & Babur (2010) for further details.

The two subgroups of bilingual children were also similar with respect to ages of onset of the acquisition of German, ranging from 2;9 to 4;4 years in the TD-L2 and from 2;11 to 4;3 years in the SLI-L2 group. Note, however, that the children with SLI were on average one year older than the typically developing bilingual children and consequently have had longer times of exposure to German. Yet, the SLI-L2’s MLU scores were lower than those of the TD-L2 group, between 2;0 and 3;9 for the former compared to 2;3 to 4;3 for the latter. This means that the children with SLI required more time and more exposure to reach an advanced stage of grammatical development than the typically developing bilingual children.

Materials
Spoken production data from 76 recordings were examined. For the SLI-L1 group, there were 22 recordings with two to five spontaneous speech samples from each child recorded over a period of one year and each recording lasting for about 45–60 minutes. For the bilingual children, 54 recordings were examined, 27 each from the SLI-L2 and from the TD-L2 children, each of which lasted for about 45 minutes. Participants were the child and one or two other participants familiar to the child under study. The recordings took place in the institutions and clinics where the children were treated. Most of the recordings of both groups of children involved free play sessions. For some of the recordings with both groups, we presented children with cartoon-like drawings in a semi-naturalistic setting and encouraged them to talk about the properties and actions of the people and animals depicted in the drawings.

Data scoring and analysis
Our analysis focuses on the kinds of endings produced with participles, which could be either –t (gekauf-t ‘bought’), –(e)n (geschlaf-en ‘slept’), no ending (gekauf) or a different ending (gekauf-e). All verb forms that could be identified as past participles due to some overt morphological marking were included into the analysis. These are morphologically marked participle forms, with the ge– prefix, a participle stem, and one of the two participle endings –t/n. In addition, we also included forms with the –t ending (but without ge– and with the base stem) that co-occurred with an auxiliary, e.g. …habe kauf’t ‘have bought’. In purely morphologically terms, kauft is ambiguous as it may also be a third sg. present-tense form. This, however, is unlikely to be the intended interpretation of cases such as …habe kauft, as it would have meant that children produced clauses with two finite verbs. We have therefore analyzed such cases as (reduced) participle forms. On the other hand, cases in which an auxiliary was combined with an –n form (…habe kaufen…) or a bare form without any affix (…habe kauf…) were analyzed separately, because these forms are potentially non-finite (infinitive, bare stems) and as
such competitors for participle forms. With respect to \(-n\) forms, it should be noted that this ending is often not clearly identifiable in the spoken language. For example, \textit{geschwommen} “swum” may simply be pronounced with a lengthened nasal, [\textipa{g\textipa{S}v\textipa{m}n}]. We therefore counted such cases along with participle forms with clearly identifiable \(-\textit{(e)nt}\) endings as correct instances of \(-n\) suffixation. To analyze the data statistically, we used non-parametric tests, the Wilcoxon test for within-group comparisons, and the Mann–Whitney test for between-group analyses. The means for the participant groups for all comparisons were based on individual participant means, each of which was calculated over all samples from each individual participant. For all analyses, “SLI-L2” is the experimental group and “TD-L2” and “SLI-L1” the control groups.

**Results**

Table 2 provides an overview of the data in the three participant groups. We distinguish between cases in which \(-t\) and \(-n\) participle forms were required (“\(-t\) context” and “\(-n\) context”); for both of them, Table 2 shows a breakdown of correct endings, incorrect endings (*\(-n\) or *\(-t\)), no ending (zero) and “other” endings.

In the TD-L2 group, there were twice as many sentences that require participles ($n = 596$) than in the two groups of children with SLI ($n = 267$ for SLI-L1, $n = 231$ for SLI-L2). In contexts in which \(-t\) was required, the number of correct forms was higher than for \(-n\) contexts, in the three participant groups. Moreover, cases of incorrect \(-n\) were extremely rare for all participants ($n = 5$), whereas overapplications of \(-t\) in \(-n\) contexts were more common ($n = 48$). Participles without any overt suffix (zero ending) were found in all participant groups, more frequently in \(-n\) than in \(-t\) contexts, particularly for the two groups of bilingual children. Finally, there were a few forms with other endings ($n = 25$). Twelve of these were \(-e\) forms (which might be a variant of \(-\textit{(e)nt}\)) and 13 “other” cases were due to acoustic distortions, through noise or because another person spoke at the same time as the child. The rate of “other” forms was low in all participant groups, 2.5% for TD-L2, 1.9% for SLI-L1 and 2.2% for SLI-L2 group. These “other” forms were not included in any of the subsequent analyses.

**Accuracy scores and overapplications**

Recall that the \(-n\) ending occurs on past participle of irregular (so-called “strong”) verbs in German, and the \(-t\) ending on participles of all other verbs. Of the \(-n\) forms produced by the children, almost all were correct, TD-L2: 98.50% (SD: 2.85), SLI-L1: 99.63% (SD: 0.90) and SLI-L2: 95.80% (SD: 6.35). By contrast, accuracy scores for \(-t\) were lower, TD-L2: 87.68% (SD: 5.0), SLI-L1: 84.30% (SD: 18.08) and SLI-L2: 88.68% (SD: 8.51). Between-group comparisons revealed that this difference in the accuracy scores for \(-t\) and \(-n\) was parallel for the SLI-L2 group and the two control groups (SLI-L2 vs. TD-L2: $Z = 1.46$, $p = 0.14$; SLI-L2 vs. SLI-L1: $Z < 1$). This contrast also holds at an individual participant level. All bilingual children

<table>
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<th>(-t) contexts</th>
<th>(-n) contexts</th>
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<tbody>
<tr>
<td></td>
<td>Totals Correct</td>
<td>(-n) Zero ending Other ending</td>
</tr>
<tr>
<td>TD-L2</td>
<td>281 236</td>
<td>2 33</td>
</tr>
<tr>
<td>SLI-L1</td>
<td>131 108</td>
<td>1 22</td>
</tr>
<tr>
<td>SLI-L2</td>
<td>101 62</td>
<td>2 36</td>
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(TD-L2 and SLI-L2) had higher accuracy scores for \(-n\) than for \(-t\) forms, and amongst the SLI-L1 group, this was the case for all but one child (Sebastian) who had similar accuracy scores for \(-t\) and \(-n\).

As can be seen from Table 2, this difference in the accuracy rates for \(-n\) and \(-t\) forms is due to the fact that the \(-t\) suffix is sometimes overapplied to participles of strong verbs, whereas \(-n\) is rarely overapplied to \(-t\) participles. The mean rates of \(-t\) overapplications (i.e. incorrect cases of \(-t\) in \(-n\) contexts) are a magnitude larger than those of \(-n\) overapplications in \(-t\) contexts, in each of the three participant groups (TD-L2: 9.4% (29/310) vs. 0.7% (2/271); SLI-L1: 9.2% (12/131) vs. 0.8% (1/131); SLI-L2: 5.6% (7/126) vs. 2.0% (2/100). This pattern is familiar from previous studies with typically developing German-speaking children, both monolingual (Clahsen & Rothweiler, 1993 and much subsequent work) and bilingual ones (Sterner, 2013).

That overapplication errors with \(-t\) are more common than \(-n\) errors has been attributed to their different morpho-lexical representations (Clahsen & Rothweiler, 1993 among others), and/or to their supposedly higher type frequency in German (Bybee, 1995); see Clahsen (1999) for discussion. Examples of \(-t\) overapplications from the current data set are *gefahren for gefahren ‘driven’ (Hande, TD-L2), *gekommen for gekommen ‘come[+participle]’ (Devran, SLI-L2), or *weggegeben for weggegeben ‘given away’ (Ben, SLI-L1).

Consider next accuracy scores by participle type, for participles that require \(-t\) and for those that require \(-n\). For participles that require \(-t\), the bilingual SLI children achieved an accuracy score of 53.75% (SD: 29.24), considerably lower than those of the two control groups (TD-L2: 82.72%, SD: 10.50; SLI-L1: 81.2, SD: 13.04). For participles that require \(-n\), accuracy scores were lower than for \(-t\) participles, in all participant groups (SLI-L2: 51.62%, SD: 26.5; TD-L2: 64.0%, SD: 6.3; SLI-L1: 72.45, SD: 20.28). Statistical within-group comparisons showed that the difference in accuracy rates between \(-t\) and \(-n\) participles was reliable for the TD-L2 group \((Z=2.2, p=0.028)\), whereas for the two groups of children with SLI, the observed numerical trend did not reach significance (both \(Zs<1\)). Reduced accuracy scores have two sources. First, as noted above, the \(-t\) suffix is sometimes overapplied to \(-n\) participles, whereas the reverse (\(-n\) overapplied to \(-t\) participles) rarely occurs, yielding more errors on the former than on the latter; this contrast holds for all participant groups. The second source of reduced accuracy scores are participles without overt suffix (zero ending), such as *gemach for gemacht ‘made’ (Devran, SLI-L2) or *runtergefallen for runtergefallen ‘fallen down’ (Arda, SLI-L2). The following section presents a more detailed analysis of these cases.

**Affix omissions**

An analysis of affix omission errors was performed for \(-t\) participles only. Participles that require \(-n\) were excluded from this analysis because an unstressed -\(en\) as a word-final syllable is often phonetically reduced in spoken German, which means a case such as [g\(\ddot{o}\)\(\ddot{u}\)] with a lengthened nasal could be mistaken for an \(-n\) omission error. For \(-t\) participles, such an ambiguity does not arise. This analysis revealed that the mean proportion of \(-t\) participles without ending was considerably higher in the SLI-L2 group (43.13%, SD: 31.04) than in both the TD-L2 (15.80%, SD: 11.35; \(Z=2.08, p<0.05\)) and the SLI-L1 group (18.50%, SD: 13.17, \(Z=1.76, p=0.078\)).

Furthermore, to assess affix-omission rates in developmental terms, we can compare them to those from longitudinal data sets of typically developing monolingual German-speaking children. For early stages of acquisition (MLU\(_W<2.75\)), 20–30% of the participles that require a \(-t\) suffix were reported to be produced without ending in typically developing monolingual German-
speaking children (Clahsen & Rothweiler, 1993). In stage III (MLU\(_W = 2.75–3.5\)), i.e. the developmental level most closely comparable to that of the children examined here (see Table 1), typically developing monolingual German-speaking children produce \(-t\) participles without ending at a mean rate of 22.6%. The corresponding mean rates of \(-t\) omissions are similar to this rate in both the TD-L2 group (19.2, SD = 11.7) and in the two SLI groups (SLI-L1: 27.9, SD = 25.2; SLI-L2: 25.9, SD = 20.7), when developmental level (in terms of MLU\(_W\)) is taken into account. Pairwise comparisons confirmed that there were no significant differences between the three participant groups on this measure (SLI-L2 vs. TD-L2: \(Z = 0.823, p = 0.410\); SLI-L2 vs. SLI-L1: \(Z = 0.210, p = 0.834\)).

Production of the ge– prefix

Recall that ge– prefixation is prosodically determined in German participles in that verb stems with unstressed initial syllables require the ge– prefix in their participle forms, irrespective of whether the required ending is \(-t\) or \(-n\). The relatively high rates of \(-t/-n\) omissions, particularly in bilingual children with SLI, raise the question of whether the ge– prefix is also omitted in these children’s participle forms more often than in the control groups. Table 3 presents mean proportions of participle forms that require the ge– prefix that were produced with ge– for the three participant groups, separately for participle forms without ending and for those with either \(-t\) or \(-n\).

Table 3 shows that ge– was overtly produced in most cases in which it was required. This was the case for both participles with and without ending as confirmed by pairwise within-group comparisons on the proportions of ge– prefixation in the three participant groups (all \(Zs < 1\)). Furthermore, pairwise comparisons of the difference scores listed in Table 3 revealed that the SLI-L2 group performed similarly to the two control groups with respect to ge– prefixation (SLI-L2 vs. TD-L2: \(Z = 1.19, p = 0.23\); SLI-L2 vs. SLI-L1: \(Z < 1\)).

Morphosyntactic aspects

In German, participles are non-finite verbal elements that in sentence contexts are combined with an auxiliary, i.e. a finite form of the verbs haben “to have”, sein “to be” or werden “to become”. To examine this construction in this data set, we included all sentences with auxiliaries and determined whether they contained a participle or some other verb form. As illustrated in (1) for Faruk, some children occasionally produce sentences containing an auxiliary plus an \(-n\) form without prefix (e.g. 1a) or a verb form without any overt inflection (e.g. 1b); recall that we did not count such cases as participles. These forms are potentially non-finite ((1a) could be an infinitive and (1b) a bare stem) and may indicate that children have not properly acquired the morphosyntactic contingency between auxiliaries and participles in German.

Table 3. Mean proportions (and standard deviations) of overt ge- prefixation on participles that require the prefix.

<table>
<thead>
<tr>
<th></th>
<th>TD-L2</th>
<th>SLI-L1</th>
<th>SLI-L2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participles without ending</td>
<td>91.42 (SD 10.4)</td>
<td>80.30 (SD 40.01)</td>
<td>91.80 (SD 11.9)</td>
</tr>
<tr>
<td>Participles with (-t/-n) ending</td>
<td>97.22 (SD 2.2)</td>
<td>72.67 (SD 37.5)</td>
<td>86.22 (SD 10.2)</td>
</tr>
<tr>
<td>Difference ending</td>
<td>5.8 (SD 11.02)</td>
<td>(-7.63 (SD10.2))</td>
<td>(-3.94 (SD 12.00))</td>
</tr>
</tbody>
</table>
The main finding from this study is that the same early sequential (Turkish–German) bilingual children with SLI who were found to be impaired in producing verb forms with correct subject–verb agreement (Rothweiler et al., 2012) did not show any difficulties in past participle formation. We examined both the morphological and the morpho-syntactic properties of participles in the SLI-L2 children’s speech in comparison to a group of typically developing bilingual children (TD-L2) as well as to a group of monolingual German-speaking children with SLI (SLI-L1). First, we found high accuracy scores of over 87% for both \(-t\) and \(-n\) participle forms in the SLI-L2 group, without any reliable difference to the two control groups. Second, the SLI-L2 children’s overapplication errors, both in terms of types and rates, were parallel to those of the two control groups. The participle affix \(-t\) was overgeneralized to verbs that require \(-n\), whereas the reverse case, i.e. overapplications of \(-n\) to verbs that require \(-t\), was extremely rare (9.2% vs. 0.1%). The same contrast has been reported for monolingual German-speaking children without SLI. Third, the SLI-L2 children were found to often omit participle endings. However, when developmental level (in terms of MLU\(_W\)) was taken into account, the omission rates were similar to those of the two control groups, or indeed monolingual German-speaking without SLI. Fourth, we found high rates of \(-ge-\) prefix suppliance (>86%) in the participles produced by the SLI-L2 children, which were not reliably different from those of the control groups. Finally, as regards their
morpho-syntactic properties, we found that the SLI-L2 children almost always combine an auxiliary with a past participle form, rather than some other finite or non-finite verb form. This was again parallel to the two control groups, not indicating any particular acquisition problems in this domain.

These results strengthen the proposal that grammatical agreement is specifically impaired in SLI German (Clahsen, 1989) without necessarily affecting other areas of verbal morphology such as past participle inflection. This contrast does not only hold for monolingual children (Clahsen & Rothweiler, 1993) but also for sequential bilingual children with SLI (Rothweiler et al., 2012). Furthermore, the case of participle formation indicates that bilingualism does not necessarily come with a disadvantage in verbal morphology. According to the weaker-links hypothesis (Gollan et al., 2008), for example, the reduced frequency of words in bilingual (compared to monolingual) language experience should lead to a disadvantage for bilinguals in language production. Gollan et al. (2008) made this proposal for morphologically simplex words. If it did extend to inflected words, bilingual children with SLI should have performed worse than monolingual ones. Our results demonstrate that this was not the case. Sterner (2013) found the same for typically developing bilingual vs. monolingual children with respect to past participle inflection. The findings from this study also indicate that bilingualism does not exacerbate SLI. Instead, the bilingual children with SLI did not score any worse on participle formation than their monolingual peers complementing what Rothweiler et al. (2012) reported for the same groups of children with respect to subject–verb agreement.

We conclude that linguistic studies of children with SLI are helpful in characterizing the nature of the language impairment in these children, irrespective of their potential weaknesses outside the domain of language. We found a within-language dissociation in bilingual children with SLI, i.e. impaired subject–verb agreement in the face of unaffected participle inflection, that together with other findings from previous studies confirms difficulties with agreement as a linguistic marker of SLI in German.

Declaration of interest

The authors report no conflicts of interest.

References


