Regular and Irregular Noun Plurals in German-Speaking Individuals with Down Syndrome

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1. Inflectional deficits in individuals with Down syndrome

Individuals with Down syndrome (DS), a genetic disorder due to a third copy of chromosome 21 or parts thereof, display marked problems in language acquisition besides a mild to moderate intellectual disability. In many affected individuals, language and intellectual abilities dissociate, with – especially productive – language abilities considerably lagging behind a level commensurate to their attained nonverbal mental development (Fowler, Gelman & Gleitman, 1994; Chapman, Seung, Schwartz & Kay-Raining Bird, 1998; Abbeduto, Warren & Conners, 2007). Inflectional morphology is considered to be particularly challenging for affected individuals (e.g., Chapman et al., 1998). In contrast, vocabulary skills seem to be less affected in individuals with DS and have often been found to conform to the nonverbal cognitive abilities reached (e.g., Næss, Lyster, Hulme & Melby-Lervåg, 2011).

Typically, deficits with inflectional morphology do not affect all inflectional systems or markers in a similar way (e.g., Penke 2008 for overview). An issue that has attracted particular interest in research on inflectional deficits is whether regular and irregular inflected forms are affected differently. Dualistic approaches to inflection assume that a difference in vulnerability is due to the fact that the representations and mechanisms involved in the production of regular and irregular inflected forms rely on two independent modules of the human language faculty: a computational component (i.e. grammar) where regular affixation is carried out and regular inflected forms are produced, and a storage component – the mental lexicon – where learned irregular inflected forms are stored and retrieved (Pinker, 1999; Clahsen, 1999; Penke, 2012). This dualistic view of inflection presupposes that deficits should be found that selectively affect only one of these components sparing the other. Inflectional deficits in individuals with DS might constitute a case in point. If regular inflection requires morphological processing – assumed to be compromised in DS – regular inflection should be

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impaired in individuals with DS. In contrast, if irregular inflected forms are stored in the mental lexicon, they should be less affected since the mental lexicon is typically developed according to or even exceeding mental-age expectations in these individuals (e.g., Næss et al., 2011).

At present, however, the evidence regarding selective deficits of regular inflectional morphology in individuals with DS is mixed – both within and across languages. For English-speaking individuals with DS, a selective deficit of regular past-tense inflection, sparing irregular inflected forms, has been reported by Eadie and colleagues (Eadie, Fey, Douglas & Parsons, 2002) who investigated spontaneous-speech recordings of ten children with DS (mean age 7 years), and by Laws and Bishop (2003) who conducted an elicitation task with 14 individuals with DS (aged 10 to 19 years). In contrast, Ring and Clahsen (2005) claim to have found no signs of a specific deficit with regular past-tense and noun-plural inflection in an elicitation task conducted with eight English-speaking adolescents with DS (aged 12 to 14 years) when uninflected forms were discarded. Likewise, in a grammaticality judgement task performed with eight Greek-speaking adolescents (aged 12 to 18 years), Stathopoulou and Clahsen (2010) reported the regular (sigmatic) and the irregular (non-sigmatic) perfective past-tense formation of existing verbs to be similar to a control group of 16 typically-developing children aged 5 to 7 years. For German-speaking individuals with DS, Penke (2019) reported a selective deficit in regular past-participle inflection for a subgroup of eight of the tested 21 children and adolescents with DS (age 5 to 19 years) who performed an elicitation task on regular and irregular inflected past-participle forms.

An explanation for the divergent findings reported in the literature might reside in sampling artefacts that arise from testing small numbers of individuals coming from a population which has been found to display a huge variability in language performance (Fowler, 1995). This possibility evokes the necessity to investigate inflectional deficits in larger numbers of affected individuals. Here, I will present new evidence on the issue of selective deficits of regular inflection that comes from an investigation of regular and irregular noun-plural inflection in a relatively large group of 30 German-speaking children and adolescents with DS.

1.1. German noun plurals – a test case for identifying selective deficits

Other than the English system of noun plural inflection, which makes use of a regular inflectional marker *-s* besides irregular forms that are often only marked by stem changes, German displays overt inflectional endings on regular and irregular noun plurals. The German plural system consists of four different plural allomorphs. Plural nouns can be marked by the endings /s/, /e/, /er/ and /n/ or they can remain unmarked.[1] With the exception of /s/-inflected plural nouns, all

[1] In addition, a fronting of the noun's stem vowel might appear for plural forms with the ending /e/ and for unmarked plural forms and it has to appear on plural nouns with the ending /er/. However, this so-called Umlaut is of no relevance for the research reported in this paper.

German noun plurals are subject to a prosodic constraint that requires the plural form to end in a reduced syllable, i.e. an unstressed syllable with Schwa or a syllabic sonorant (Neef, 1998). By affixation of the plural markers /e/, /er/ and /n/ this constraint is fulfilled (e.g., 1 *Bär* – 2 *Bären* [**bɛ**.ʁən] 'bear(s)', *Tisch* – *Tische* [**ti**.ʃə] 'table(s)', *Kind* – *Kinder* [**kɪn**.dəʁ] 'child(ren)').

The plural ending /n/ is particularly suited to investigate selective deficits of regular or irregular inflected forms as it surfaces on regular as well as on irregular inflected noun plurals. On feminine nouns ending in /ə/ in the singular form (e.g., *Eule* [**ʔɔɪ**.lə] 'owl') the plural ending /n/ is completely predictable and considered to be regular (*Eulen* 'owls') (e.g., Bittner, 1994; Wunderlich, 1999; Penke & Krause, 2002). On masculine and neuter nouns that do not end in /ə/ in the singular form (e.g., *Bär* 'bear') the plural ending /n/ (*Bären*) is considered to constitute an irregular ending since it is neither productive for masculine and neuter nouns nor predictable on the basis of the phonological shape of the nouns that take this ending (Wiese, 1999; Penke & Krause, 2002; Bartke, Rösler, Streb & Wiese, 2005). As the phonological complexity of regular and irregular /n/-inflected plural nouns does not differ and as both types of /n/-plurals display a similar type frequency (Bartke et al., 2005), German /n/-plurals constitute an ideal test case to identify selective deficits of regular or irregular inflected forms.

1.2. Aim of study

The paper aims to present new evidence on the issue of selective deficits of regular inflection in individuals with DS that comes from an experiment eliciting regular and irregular inflected /n/ noun plurals from a relatively large group of affected participants. To evaluate whether the production of regular and/or irregular inflected noun plurals in individuals with DS differs quantitatively and/or qualitatively from the performance of typically-developing children, the performance of individuals with DS is compared to the performance of a group of typically-developing children (TD) matched in chronological age to the nonverbal mental age of the participants with DS. This comparison allows for differentiating an inflectional deficit in children and adolescents with DS from a performance that is expected given their level of cognitive development. Specifically, a performance of the participants with DS that is significantly beneath the performance of the TD control children is indicative of an impairment of inflectional morphology that cannot be accounted for by the level of the cognitive development reached by these individuals.

2. Method

2.1. Participants

Noun plurals were elicited from 30 children and adolescents with DS (12 female) aged 4;07 to 19;02 years (*M* 11 years). For two of them the parents reported a mild hearing loss of less than 25 dB. For the remaining participants with DS no permanent hearing loss had been diagnosed. None of the participants displayed additional medical or behavioral conditions (such as epilepsy,

psychosis or anxiety disorders) according to parental reports in a questionnaire addressing participants' biographical and medical histories. Nonverbal mental age was assessed using the reasoning subscale of the Snijders-Oomen Nonverbal Intelligence Test (SON-R 2.5-7, Tellegen et al., 2007). It ranged from 2;11 to 6;05 years (*M* 4;05). All participants lived with their families and were either enrolled in regular school classes or visited schools for children with special educational needs. All participants had received special intervention, including speech and language therapy, from birth or early childhood on.

Performance of the participants with DS was compared to a control group of 26 typically-developing (TD) children (13 female) that were recruited from local kindergartens. The group of TD children was statistically matched in chronological age to the nonverbal mental age of the participants with DS. The mean chronological age of the children in the TD group was 4;04 years, ranging from 3;04 to 5;07 years. Statistical testing yielded no significant difference between the chronological age of the TD group and the nonverbal mental age of the group of participants with DS ($t(54) = .479$, $p = .63$, $d = .128$). None of the TD children had a history of hearing or speech/language problems and the children displayed no evidence for physical or cognitive impairments.

All participants of the TD and DS group were monolingual speakers of German. Table 1 gives an overview of the two participant groups.

Table 1: Overview of participants with Down syndrome (DS) and typically-developing (TD) children

Group	N	Sex	Chronological age in years (y;mm)*		Nonverbal mental age in years (y;mm)	
DS	30	12f, 18m	*M*	11;00	*M*	4;05
			SD	3;08	*SD*	0;11
			range	4;07 - 19;02	range	2;11 - 6;05
TD	26	13f, 13m	*M*	4;04		
			SD	0;08		
			range	3;04 - 5;07		

2.2. Procedure

Elicitation of noun plurals proceeded as follows: Participants were first presented with a picture displaying a single object named by the experimenter (e.g., *Look, this is a bear*). Then, a picture displaying three of these objects was presented and the participant was asked to produce a plural form (e.g., *Now there are some more. Now there are ___ ?*). In total, 40 existing noun plurals were elicited per participant. The paper focusses on the 8 items eliciting regular /n/-plurals (henceforth -n^{fem}-plurals) and the 8 items eliciting irregular /n/-plurals (henceforth -n^{nonfem}-plurals). For a short overview of the results obtained for the whole set of items see Penke and Witecy (2021).

Regular and irregular /n/-items were matched for lemma and plural-form frequency according to the CELEX database (Baayen, Piepenbrock & Van Rijn, 1993) (*-n^{fem}*-items: mean lemma frequency 24.4, mean plural-form frequency 12.6; *-n^{nonfem}*-items: mean lemma frequency 37.4, mean plural-form frequency 17.1, difference in frequency distribution between *-n^{fem}*-items and *-n^{nonfem}*-items $p > .45$ each). To tap into the productive abilities of the participants all tested items were of relatively low frequency. All tested nouns were simplex nouns of one to two syllables length. Syllable structure of the plural forms was simple, mostly CV and CVC (one CCV).

Participants were tested individually after a short practice phase (4 practice items) familiarizing them with the task. During testing, items were presented in the same previously randomized order for all participants and no feedback was given. All experimental sessions were video- and audiotaped. Participants' reactions were transcribed and transcripts were checked against the video files by a second independent researcher.

Produced forms were analyzed when the participants produced a form of the target noun. In total, 93.5% of the reactions of the participants with DS and 98.3% of the reactions of the TD children were analyzable. Analyzable forms were then evaluated for the correctness of the plural form of the 16 critical items. An inflectional error was counted if a wrong inflectional ending was used instead of the correct ending (e.g., **Bärs, *Bäre* or if the inflectional ending was omitted (e.g., **Bär*). Based on these data, accuracy scores for *-n^{fem}-* and *-n^{nonfem}*-plurals were calculated for each participant and compared by a two-factorial, mixed *ANOVA*. The level of statistical significance was set at $p < .05$.

The research reported in this paper was performed according to the guidelines of the Declaration of Helsinki and approved by the Ethics Committee of the Medical Department of the University of Cologne (approval nr. 12-033). All participants' parents gave prior written informed consent to their children participating in the study.

3. Results

3.1. Accuracy scores

Figure 1 presents the accuracy scores for the two groups of participants and both types of /n/-plurals. For both types of /n/-plurals, the group of participants with DS achieved lower mean accuracy scores than the group of TD children. Whereas the group of TD children obtained a mean accuracy score of 91.3% for regular *-n^{fem}*-plurals, the corresponding score for the group of participants with DS was at only 47.1%. For irregular *-n^{nonfem}*-plurals the TD group obtained a mean accuracy score of 46.7%, the mean accuracy score of the participants with DS was 31.7%.

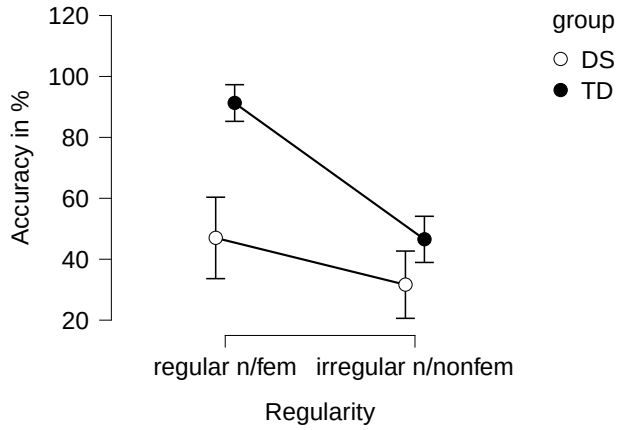

Figure 1: Accuracy scores for regular and irregular /n/-plurals obtained by the two participant groups

A two-way factorial analysis of variance with SUBJECT GROUP (DS vs. TD) as between-subjects factor and REGULARITY (regular -n^{fem}-plural vs. irregular -n^{nonfem}-plural) as within-subjects factor revealed a significant main effect of participant group ($F(1,54) = 20.2$, $p < .001$, $\eta p^2 = .27$), with the group of TD children achieving higher accuracy scores than the group of participants with DS. A significant main effect was also obtained for the factor REGULARITY ($F(1,54) = 114.5$, $p < .001$, $\eta p^2 = .68$), reflecting that accuracy scores for regular -n^{fem}-plurals were significantly higher than accuracy scores for irregular -n^{nonfem}-plurals in both groups of participants. Most importantly, the interaction of the factors SUBJECT GROUP X REGULARITY was also significant ($F(1,54) = 27.3$, $p < .001$, $\eta p^2 = .34$), indicating that group differences were more pronounced for regular compared to irregular plural forms. Post-hoc testing (*Bonferroni*) yielded no significant group difference for the accuracy scores obtained for irregular -n^{nonfem}-plurals ($t = 2.1$, $p = .24$), whereas for regular -n^{fem}-plurals the group of TD children obtained significantly higher accuracy scores than the group of participants with DS ($t = 6.2$, $p < .001$).

Analyses correlating accuracy scores for both types of /n/-plurals with the chronological and the nonverbal mental age of the participants with DS, yielded no significant relationships for -n^{fem}-plurals (*Spearman* rank correlation, $p > .2$ each). For -n^{nonfem}-plurals, accuracy scores displayed a tendency to increase with chronological age ($p = .064$) but not with mental age ($p = .15$).

While group results revealed a significant difference between the accuracy scores for -n^{fem}-plurals obtained by the participants with DS and the TD children, the participants with DS displayed huge interindividual differences with respect to these accuracy scores. Eight participants with DS obtained accuracy scores for -n^{fem}-plurals that were within 1 *SD* of the TD children's mean accuracy score. Whereas these eight participants achieved a mean -n^{fem}-accuracy score of 92%, the corresponding score for the other 22 participants with DS was at only 30.7%.

3.2. Error analysis

In total the participants with DS produced 267 errors with the elicited /n/-plurals. Overall, 76.8% of the incorrect forms produced by the participants with DS were unmarked forms where the /n/-marking was missing. As mentioned above, a prosodic constraint requires all native German noun plurals to end in a reduced syllable. An error analysis was conducted to evaluate whether participants adhered to this constraint in their incorrectly produced noun plurals. Only nouns taking the *-n*^{nonfem}-plural were evaluated in this analysis since nouns taking the *-n*^{fem}-plural already end in a reduced Schwa-syllable in the singular form (e.g., *Eule* [**ʔɔɪ**.lə] 'owl'). In contrast, nouns taking the *-n*^{nonfem}-plural typically end in a stressed syllable in the singular form (e.g., *Bär*, *Pirat* [pi**.ʁat**] 'pirat'). Leaving these forms unmarked, thus, results in a prosodically illicit plural form. The error analysis yielded that a substantial proportion of the incorrectly produced plural forms for *-n*^{nonfem}-nouns were left unmarked by the participants with DS (59.6%) and were, thus, violating the prosodic constraint on German plural forms. This proportion was significantly higher than the proportion of unmarked forms produced by the group of TD children (27.5%) ($t(53) = 2.97$, $p = .004$, $d = .8$). The high proportion of produced forms that do not adhere to the prosodic constraint on German plural nouns suggests that this prosodic constraint is not fully operative in the participants with DS. The huge majority of the unmarked forms produced by the participants with DS were, however, accompanied by the numeral *three* or the quantifier *many* (82.9%), suggesting that the concept of plurality was expressed by numeral or quantifier instead of the unavailable inflected plural form.

4. Discussion

4.1. Regular plural inflection is selectively affected in individuals with DS

The data indicate that noun plural inflection is impaired in German-speaking individuals with DS. Moreover, the statistical analysis suggests that this deficit selectively affects regular *-n*^{fem}-plural formation: Whereas accuracy scores for regular *-n*^{fem}-plurals were significantly lower compared to a matched group of TD children, accuracy scores for irregular *-n*^{nonfem}-plurals did not differ for the two groups of participants. Thus, while the production of irregular inflected /n/-plurals was at a level expected for the mental age attained by the participants with DS, performance for regular *-n*^{fem}-plurals was significantly below mental-age expectations, indicating an impairment. This finding conforms to previous findings on inflectional deficits in DS that have also found regular inflection (English past-tense inflection and German past-participle inflection) to be selectively affected in individuals with this syndrome (Eadie et al., 2002; Laws & Bishop, 2003; Penke, 2019). Together, these findings provide converging evidence that a selective deficit with regular, but not irregular, inflection is a symptom that characterizes language deficits in DS.

This symptom, however, does not hold for every affected individual. A closer look at the accuracy scores for regular *-n*^{fem}-plurals achieved by the participants

with DS revealed huge interindividual differences: A small group of eight participants performed within the range of the TD children and achieved accuracy scores of over 85% each, indicating that these individuals had successfully acquired the regular -n^{fem} noun plural. In contrast, a larger group of 22 individuals with DS performed below the range of the TD children for the regular -n^{fem}-plural and, thus, below mental-age expectations. Their mean accuracy score of only 30.7% points to a pronounced deficit with regular plural inflection. The identification of subgroups of individuals with DS that are differently affected with respect to specific language abilities is in accordance with previous reports in the literature. Thus, Laws and Bishop (2003) found that while the tested group of 14 individuals with DS achieved significantly lower accuracy scores for regular past-tense inflection than the control group of TD children, seven of these participants performed within the range of the TD children. Rutter and Buckley (1994) investigated the acquisition of grammatical morphemes in 12 English-speaking children with DS (age 12 to 38 months) and report considerable variation with respect to the acquisition of inflectional markers within their participants (see table 4 in Rutter & Buckley, 1994). While six children are reported to have acquired the regular past-tense marker *-ed* over the 30 months of investigation, the other six participants failed in this respect. A similar observation is made by Chapman and colleagues (1998) who found that nine of the tested 23 individuals with DS (age 12 to 20 years) produced the English past-tense marker *-ed* without omissions in spontaneous-speech, whereas the others had not yet fully mastered this inflectional marker (see table 4 in Chapman et al., 1998). Although selective deficits with regular inflection affect a substantial proportion of individuals with DS, the huge interindividual variation found within this group cautions us to look beyond group means and to consider individual strengths and weaknesses in affected individuals, an insight that is especially relevant for therapeutical settings.

While the finding of a selective deficit with regular German plural inflection is in line with previous findings reporting selective deficits of regular English past-tense inflection in individuals with DS (Eadie et al., 2002; Laws & Bishop, 2003), studies investigating the regular English *-s*-plural in affected individuals often report mental-age appropriate performance and high accuracy scores for this regular inflectional marker. Thus, while Eadie and colleagues (2002) found regular English past-tense inflection to be selectively affected in their participants with DS, the ten tested children with DS achieved accuracy scores between 84% and 100% for the regular *-s*-plural, scores that did not differ from the scores of the MLU-matched control group of TD children. Similar findings have been reported by Fowler and colleagues (1994), O'Neill and Henry (2002) and Ring and Clahsen (2005). In contrast, deficits have been found for the regular Spanish noun-plural inflection that is phonologically conditioned (Lázarro, Garayzábal & Moraleda, 2013). Lazzaro and colleagues observed that performance of 30 children/adolescents with DS (aged 6 to 18 years) was significantly below the performance of two groups of TD children matched for mental age (n = 30, aged 5 to 7 years) and vocabulary size (n = 30, age 7 to 9 years) in an elicitation task on existing noun plurals. A deficit in noun plural inflection is also reported in a

recent paper on Arabic noun plurals, presenting data from 60 children and young adults with DS (Mashaqba, Sa'aleek, Huneety & Al-Shboul, 2020). Further research is needed to determine whether these divergent findings are due to differences relating to group size and sampling errors of the participants tested in these studies or whether factors such as the type frequency of a regular inflectional marker or the number of inflectional allomorphs in an inflectional system might account for the differential cross-language vulnerability of regular inflectional markers in DS. Note in this respect that the marker *-s* is the only plural marker in English and applies to 98% of the pluralizable noun types in the database of Francis and Kucera (1982) according to Marcus, Brinkmann, Clahsen, Wiese and Pinker (1995). This might make acquisition of this inflectional marker easier for individuals with DS than the acquisition of markers that compete with other allomorphs and/or apply to fewer words, as is, for example, the case for the regular German *-n*^{fem}-plural.

First evidence suggests that a selective deficit of regular inflection might be specific to DS in German-speaking individuals. Penke and Krause (2004) elicited regular and irregular /n/-plurals from five monolingual German-speaking adolescents with Williams syndrome (aged 15 to 18 years, mental age 6 to 9 years), another neurodevelopmental disorder of genetic origin that is associated with mild to moderate intellectual disabilities, and found regular *-n*^{fem}-plurals to be unaffected. Kauschke, Kurth and Domahs (2011) elicited /n/-plurals in eight German-speaking children with Developmental Language Disorder (DLD) (age 4 to 5 years) and report no significant difference to a group of eight TD children matched for MLU. Note however, that the 16 /n/-plurals tested by Kauschke and colleagues only involved three *-n*^{nonfem}-plurals and two *-n*^{fem}-plurals. High accuracy rates for noun plurals were also observed by Clahsen, Rothweiler, Woest and Marcus (1992) for 19 German-speaking children with DLD in spontaneous-speech data. These data suggest that a deficit with regular noun-plural inflection might not be characteristic for other developmental language disorders in German-speaking individuals. Evidence suggesting a syndrome-specific deficit of regular inflection in German-speaking individuals with DS has also been found for regular past-participle inflection. While a selective deficit of regular past-participle inflection has been reported for German-speaking individuals with DS, a comparable deficit has so far not been documented in studies testing past-participle inflection in German-speaking adolescents with Williams syndrome or in German-speaking children with DLD (see Penke, 2019). Further research is needed to investigate the assumption that a selective deficit of regular inflection might be specific to the syndrome of DS in German.

4.2. Evidence for dualistic models of inflection

Selective deficits of regular inflection have often been attributed to differences regarding the phonological complexity of regular and irregular inflected forms (e.g., Joanisse & Seidenberg, 1999). In English, irregular inflection in noun plurals or past-tense forms is often only marked by stem changes. In contrast, the suffixation of an inflectional marker *-ed* or *-s* to the

word's stem typically results in a consonant cluster in word final position that might be more difficult to perceive and to produce. It has therefore been suggested that selective deficits with regular inflected words are not indicative of two different inflectional processes involved and selectively affected, as invoked by dualistic models of inflection, but that they are rather caused by problems in perceiving and/or producing these inflected forms (e.g., Joanisse, 2004). In fact, individuals with DS often suffer from frequent episodes of otitis media (e.g., Davies, 1996) associated with a mild to moderate conductive hearing loss, and from differences in the structure and functioning of articulators such as tongue and palate as well as muscle hypotonia that might affect speech production (e.g. Abbeduto et al., 2007; Kent & Vorperian, 2013). Consequently, it has been suggested that deficits in producing inflected forms in individuals with DS might be due to articulatory and perceptional problems that only mimic an inflectional deficit (e.g., Christodoulou, 2015). Due to their phonological characteristics, such problems would especially affect regular inflected forms in English, such as past-tense forms and noun plurals.

While differences in the phonological shape of regular and irregular inflected words might account for the observed selective deficit in regular past-tense inflection in English-speaking individuals with DS, the selective deficit with the regular -n^{fem}-plural, described here, cannot be attributed to phonological factors differentiating regular from irregular /n/-plurals: Both types of /n/-plurals take the same inflectional marker /n/ and the resulting noun plurals display a similar phonological shape, ending in a reduced Schwa-syllable (e.g., [**ʔɔɪ**.lən] 'owls' -n^{fem}-plural vs. [**bɛ**.ʁən] 'bears' -n^{nonfem}-plural). Moreover, the tested /n/-plural items were carefully matched with respect to their phonological complexity, with the noun's plural form always ending in a CVC syllable. Thus, the selective deficit of regular -n^{fem}-plurals cannot easily be accommodated in a unitary model of inflection that advocates that the same representations and procedures underly regular and irregular inflected forms and that differences with respect to the production of these forms are grounded in phonological differences between them. Rather, the selective deficit with regular /n/-plural inflection suggests that regular and irregular inflection rely on two distinct mental representations and operations: storage of irregular inflected forms in the mental lexicon – which is developed according to mental-age expectations in individuals with DS, and a productive process of affixation that is affected in a substantial proportion of individuals with DS.

Another observation provides additional support for such a dualistic view to regular and irregular inflection. Whereas TD children achieved a mean accuracy score for regular -n^{fem}-plurals of over 90%, indicating that they had acquired the regular -n^{fem}-plural marking, accuracy scores for irregular /n/-plurals were significantly lower. Thus, although regular and irregular /n/-inflected noun plurals display the same plural marker and the tested items were of similar frequency (lemma and word form frequency), the TD children's performance for these two types of /n/-plurals differed significantly. Such a difference is to be expected under the dualistic view. Whereas irregular inflected forms have to be learned and stored on a word-by-word basis, leading to a prolonged acquisition process, once

the regular inflectional affix has been identified it can be applied productively whenever its input conditions for affixation are met. Thus, high accuracy rates for the regular -n^{fem}-plural are expected once this inflectional marker has been acquired, while, at the same time, irregular -n^{nonfem}-plurals are still in the process of being learned and stored on a word-by-word basis. Both findings, the different development of regular and irregular inflected /n/-plurals in TD children and the finding that regular /n/-plurals are selectively affected in the group of participants with DS, are in accordance with a dualistic view to inflection that states a qualitative difference between regular and irregular inflection.

The observed deficit with regular /n/-plural inflection also provides evidence against another suggestion how to account for the deficits with past-tense inflection in English-speaking individuals with DS. Several studies have investigated whether the Extended Optional Infinitive Hypothesis might account for deficits with inflectional morphology in children/adolescents with DS (Eadie et al., 2002; O'Neill & Henry, 2002; Ring & Clahsen, 2005). According to this hypothesis, originally proposed to capture deficits with tense and agreement inflection in children with DLD (Wexler, Schütze, & Rice, 1998), an optional infinitive results when the child leaves the tense and/or agreement features of the syntactic category INFL underspecified. In children with DLD, the time period where the tense feature may be left underspecified is said to be extended. However, as indicated by the deficit with plural inflection observed here, problems with inflectional morphology in children/adolescents with DS are not restricted to tense/agreement inflection. This finding confirms earlier evaluations that have also questioned the applicability of the Extended Optional Infinitive Hypothesis to capture inflectional impairments in individuals with DS (Eadie et al., 2002; O'Neill & Henry, 2002; Ring & Clahsen, 2005).

4.3. Insights from error analysis

An analysis of the incorrect, unmarked forms produced by the individuals with DS in the elicitation task on noun plurals described here suggests that their language deficit is not restricted to regular inflectional processes. The observation that most incorrectly produced -n^{nonfem}-nouns were left unmarked and, thus, violated the prosodic constraint that requires German noun plurals to end in a reduced syllable, suggests a deficit that encompasses this prosodic constraint. Future research should target related processes at the interface between morphology and phonology in individuals with DS to highlight the scope of language impairments in affected individuals.

Finally, the observation that most of the incorrectly produced unmarked /n/-plurals were, nevertheless, produced with a preceding numeral suggests that the tested participants with DS had already grasped the concept of plurality and used a quantifier or numeral to express this concept when they could not access or produce the requested inflected plural form, a behavior that has been described for young children (age 2 to 3 years) acquiring English noun plural inflection (Clark & Nikitina, 2009).

4.4. Limitations

Some limitations of this study have to be mentioned. For one, the number of regular and irregular /n/-plurals tested was relatively small. This, however, was due to the intention not to overtax participants' abilities to focus on the task at hand. As the elicitation task on noun plurals was only one task in a battery of tasks testing various morphosyntactic abilities in the participants, it had to be short. Another limitation is that the test battery did not contain a measure of vocabulary. Without such a measure it cannot be determined whether or not the vocabulary was at a level appropriate for the mental age achieved by the participants. Also, the number of plural nouns in expressive and receptive vocabulary or the amount and quality of child directed speech, especially with respect to type and token frequencies of noun plurals, might have had some impact on the issue whether participants with DS succeeded or failed in acquiring the regular *-n*^{fem}-plural, but were not assessed in this study. Whether and how these factors affect the acquisition of noun plural inflection has to be left to future research.

5. Conclusion

Concluding, the present study has provided evidence that regular inflectional processes are selectively affected in a substantial number of individuals with DS. The selective deficit observed in affected individuals seems to be best captured in a dualistic model of inflection which assumes regular inflected forms are produced via a mental affixation operation, whereas irregular inflected forms are stored as fully inflected forms in the mental lexicon. More research is needed to confirm the suggestion that, in German-speaking individuals, a selective deficit of regular inflection is specific to DS and does not occur in other developmental language disorders.

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