SPECIAL SECTION
GENDER AND CASE IN AGRAMMATIC PRODUCTION

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ABSTRACT

Omission and substitution of articles have often been mentioned as characteristics of agrammatic speech. In these descriptions, articles are considered to be so-called function words or closed-class words. These are supposed to be difficult for agrammatic speakers. From a linguistic point of view, the class of function words is far from homogeneous and even within the class of articles different linguistic properties can be distinguished. In many languages – Dutch, German, Italian and Portuguese are used as examples in this paper – the article is specified for gender. In German the article is specified for case as well. Gender and case differ from both a linguistic and a psycholinguistic point of view. Gender information is part of the word form. In some languages, gender can be derived from the word-form (as in Portuguese or Italian), while in other languages, the gender of nouns is stored as part of the word-form (as in Dutch and German). Case is a syntactic notion and relates to a dependency between the constituents in a sentence. Bearing in mind the fact that article production is impaired in agrammatic Broca’s aphasia, one may wonder whether gender and/or case information plays a role here.

For the present study, article production of nine Dutch and ten German individuals with agrammatic Broca’s aphasia has been analyzed and the data show that most substitution errors concern case; the gender of the produced articles is usually correct. This supports the hypothesis that agrammatic speech is the consequence of an underlying deficit in syntactic processing.

Key words: agrammatism, case, gender, syntax

INTRODUCTION

Agrammatism has been characterized by the omission and substitution of free and bound grammatical morphemes (e.g. Goodglass, 1968; Caramazza and Berndt, 1985; Thompson et al., 1993). The present study focuses on the article and evaluates whether the source of the problem with this function word is the fact that it bears gender information, or that another aspect of articles, case, causes the difficulties. In aphasiology, the article has received little attention and the reason for this is obvious: most of the research on agrammatic production is based on English. From an Anglo-Saxon point of view, the article is of interest only in relation to (in)definiteness: it is the or a(n) and there is neither gender nor case information visible. In other Germanic languages, such as Dutch, and in Romance languages, such as Italian and Portuguese, however, the article is specified for gender. In German the article is specified for both
case and gender. There is a difference between gender in Germanic and in Romance languages. Generally speaking, in Germanic languages the gender of a noun should be learned, whereas in Romance languages it can often be derived from the form of the noun: words ending in -o are masculine, words ending in -a are feminine. Case is an interesting concept, as linguistic theory, for example Chomsky’s Government and Binding (GB) Theory (Chomsky, 1986), generally assumes that every language has case, although it is not always visible. This means that in English, noun phrases always have case, but this is only visible when the noun phrase is a pronoun (nominative vs. accusative: I vs. me; he vs. him).

The present study evaluates article production by Dutch and German agrammatic speakers. First, we will give the relevant linguistic and aphasiological background, leading to the hypothesis that case information will be impaired as it is a syntactic concept and gender will be intact as it is a lexical concept. Then, the methods and tests will be described. Subsequently, the results will be presented, showing that gender and case have a different influence on the production of articles in agrammatic speech. In the discussion, we will argue that the findings support our hypothesis that the problems with articles are caused by a disorder in syntactic processing.

**LINGUISTIC BACKGROUND**

All Germanic and Romance languages have definite and indefinite articles. In some languages, such as English, these are not further specified: definite is the, indefinite is a. In Romance languages, such as Spanish, Italian and Portuguese, there are feminine and masculine nouns: their gender agrees with that of the article: Portugese: a/uma rosa (the/a rose, feminine), o/um banco (the/a bank, masculine). German also has the neuter gender: der/ein Mann (the/a man, masculine), die/eine Frau (the/a woman, feminine), das/ein Kind (the/a child, neuter). German also has overt case marking on the article: der Mann (the man, nominative), den Mann (the man, accusative). In other Germanic and Romance languages, case is only visible in pronouns (with the exception of Icelandic where case is realized as a suffix on the noun). A third property of articles is number: single versus plural, which is usually only used for the definite article: a rosa / as rosas (the rose, the roses). In Portuguese, indefinite articles may also be used in plural: uma rosa, umas rosas (a rose, ‘some’ roses). The present study focuses on gender versus case and therefore, number will further be ignored.

**Gender**

In Italian, Portugese and Spanish, the gender of a noun is often predictable on the basis of its lexical form. As a gross generalization, in Italian, Spanish and Portugese, words ending in –o are masculine. Each of these languages has more specific rules. In Italian, for example, there is a considerable number of words...
ending in -e, which are not specified for gender (e.g. volpe ‘fox’, fem.; leone ‘lion’, masc.). For these words, the gender is not transparent and needs to be learned per word. (see Luzzatti and De Bleser, 1996). In Portuguese, words ending in -a (and -ade, -ez, -ice, -gem, -ã, çoão, sào, dão) are feminine, words ending in -o (and all other endings) are masculine. There is a relatively small number of exceptions (o dia: the day). Considering the very low number of exceptions, one can easily derive the gender from the word form, meaning that the gender of a word does not have to be learned. When a non-word (or a new word) shows up, its gender can be derived from its form: in Portuguese it is o computador (the computer, masculine).

In Germanic languages, gender cannot be derived from the word form. Both Dutch and German have three genders for the nouns: masculine, feminine and neuter. For Dutch, the paradigm is given in (1).

(1) Article paradigm for Dutch

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>definite</td>
<td>indefinite</td>
</tr>
<tr>
<td>masc.</td>
<td>de</td>
<td></td>
</tr>
<tr>
<td>fem.</td>
<td>de</td>
<td></td>
</tr>
<tr>
<td>neuter</td>
<td>het</td>
<td></td>
</tr>
</tbody>
</table>

The difference between masculine and feminine cannot be seen anymore: both types of nouns get the definite article de; the definite article used for neuter nouns is het. The indefinite article is een for all three genders and the plural definite article (like other Germanic languages Dutch has no visible plural indefinite article) is de for all three genders. Female humans and animals are feminine, male humans and animals masculine. This ‘natural gender’ is overruled, however, by one of the few regularities in the Dutch gender system, that is, diminutives are neuter: het meijsje (the girl, neuter). Whether a noun is masculine/feminine or neuter has to be learned and can by no way be generated from the word-form (this makes Dutch articles very difficult to learn for second language learners). Dutch native speakers in general do not have a clue whether a de-article is masculine or feminine and usually refer to all words with hij (he).

In German, the difference between masculine and feminine has been maintained. Just as in Dutch, nouns for female humans and animals are feminine and nouns for male humans and animals are masculine and this is overruled by diminutives, which are neuter (das Mädchene: the girl, neuter). The paradigm (given in 2) is a bit more complicated than in Dutch, as gender is also

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1 In German, the adjective is inflected for gender and case too, but since this paper focuses on articles, gender on adjectives is further ignored.
visible on the indefinite article. For plural forms, no difference in gender is made, unlike in Romance languages.

(2) Article paradigm with respect to gender for German

As in Dutch, there is no clear relationship between word form and gender, meaning that gender cannot be generated from the word form and needs to be learned for each noun separately.

Comparing gender of nouns in Germanic and Romance languages, one may conclude that in Germanic languages gender is lexically based (it must be learned and stored with the word form in the lexicon), whereas in Romance languages it is rule-based (that is, based on the word form). This is not the same for all Romance languages, however: in French, the gender of many words must be learned, just as in Germanic languages.

In all languages in which the article is related to the gender of the noun, there is an agreement relationship. This relationship is lexical by nature, meaning that the information about this agreement relationship is stored in the lexicon.

Case

Another property of articles is that they bear case, although in many languages this is not visible. Latin, the mother of the Romance languages, had a rich case system (but no articles). This has vanished in modern Romance languages. The only Germanic language that still has case visibly expressed in articles is German in which nominative, genitive, dative and accusative case are distinguished. Not only are the articles in a noun phrase marked for case: demonstratives have a similar paradigm and adjectives and nouns are case-marked in some instances as well. Since this study focuses on articles, the other word classes are further ignored. The complete German paradigm is given in (3).

(3) Paradigm for definite articles with respect to case for German

<table>
<thead>
<tr>
<th></th>
<th>masculine</th>
<th>feminine</th>
<th>neuter</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>nominative</td>
<td>der</td>
<td>die</td>
<td>das</td>
<td>die</td>
</tr>
<tr>
<td>genitive</td>
<td>des</td>
<td>der</td>
<td>des</td>
<td>der</td>
</tr>
<tr>
<td>dative</td>
<td>dem</td>
<td>der</td>
<td>dem</td>
<td>den</td>
</tr>
<tr>
<td>accusative</td>
<td>den</td>
<td>die</td>
<td>das</td>
<td>die</td>
</tr>
</tbody>
</table>
According to generative theory, case is assigned to a noun phrase by a case assigner. The most frequent case assigners are verbs and prepositions and this kind of case assignment will be discussed here. The finite verb assigns nominative case to the subject of the sentence. For English this can best be illustrated with pronouns: in *he reads*, the finite verb *reads* assigns nominative case to the pronoun; in *he is reading*, the finite auxiliary *is* assigns nominative case. When there is no finite verb in English, the subject receives accusative case ‘by default’: *What, me on the bike and him in the car??!! No way!!*. In Dutch and German, these verbless subjects receive nominative case by default; the translation of the above example in Dutch is: *Wat, ik nom op de fiets en hij nom met de auto??!! Dat nooit!!!*

The (transitive) verb assigns dative or accusative case to the object\(^2\). For English, in the sentence: *the dog is chasing her*, ‘her’ is supposed to receive accusative case from ‘to chase’. In (4) some examples are given for German.

(4) Case assignment by verbs in German

\[
\begin{array}{ccc}
\text{der Mann} & \text{wird} & \text{den Jungen} \\
\text{the} & \text{will} & \text{the} \\
\text{nom} & \text{acc} & \\
\text{man} & \text{boy} & \\
\end{array}
\]

\[
\begin{array}{ccc}
\text{der Mann} & \text{wird} & \text{dem Jungen} \\
\text{the} & \text{will} & \text{the} \\
\text{nom} & \text{dat} & \\
\text{man} & \text{boy} & \\
\end{array}
\]

Not only verbs, but also prepositions assign case; in German, this may be genitive, dative or accusative case. This mechanism is similar to case assignment by verbs, as shown in (5).

(5) Case assignment to masculine nouns by prepositions in German

\[
\begin{array}{ccc}
\text{aufgrund des} & \text{Betruges} & \text{because of the fraud} \\
\text{mit dem} & \text{Mann} & \text{with the man} \\
\text{bis den} & \text{Abend} & \text{until the evening} \\
\end{array}
\]

The assumption that case is assigned to noun phrases by case assigners (e.g. verbs and prepositions) supposes a *syntactic* relationship between case assigners and case-assignees.

From this linguistic background we can conclude that articles contain information of two independent factors, *gender* and *case*. Gender is related to the word form, and is therefore assumed to be a *lexical* factor, which may either be generated by a rule, as in Romance languages, or must be learned with the word, as in Dutch and German. Case is assigned by a verb or a preposition. It is syntactic by nature, because it depends on the grammatical role of the noun phrase to which case is assigned. This case assignment takes place at the level

\(^2\) There is a theoretical difference between assignment of dative and accusative case; this is irrelevant for our argumentation here and it will therefore be ignored (see, however, Bastiaanse et al., 2002).
of syntactic encoding. Hence, although there are agreement relationships for both gender and case, it is only for case that there is agreement in a syntactic sense.

It has never been evaluated why articles are difficult for agrammatic speakers: is it because of a lexical aspect (gender) or a syntactic aspect (case)? The present study teases these two apart. Before we discuss our study, we will briefly focus on the literature on gender and case in relation to aphasia.

APHASIOLOGICAL BACKGROUND

In agrammatic speech, grammatical morphemes are often omitted and/or substituted. Bastiaanse (in press) argues that these omissions and substitutions reflect an underlying problem in syntactic encoding. This syntactic encoding deficit causes diminished processing capacity for complex information, for example, information that comes with the verb. When more information needs to be encoded, more problems will arise. In this way, Bastiaanse (in press) explains the preference that agrammatic aphasics demonstrate for nouns over verbs, infinitives over non-finite verbs, sentences in canonical over non-canonical word order. With regard to articles, this theory predicts that in agrammatism the syntactic aspect of articles, case, will be more affected than the lexical aspect, gender.

In the aphasiological literature, there is some support for this hypothesis. Luzzatti and De Bleser (1996) present two Italian-speaking agrammatic aphasics. They both perform very well on a task in which they have to give the proper article with a noun, but one of them is consistently wrong with left-headed compound nouns, in which gender corresponds with the first noun of the compound (il masc bagno masc schiuma fem : the bath foam). Luzzatti and De Bleser (1996) suggest that gender is relatively undisturbed, as long as no syntactic processes are involved. De Bleser et al. (1996) have shown that agrammatic German speakers do not have problems inflecting a noun phrase for gender on a single word task; they are able to produce the proper article for a given noun. When they are asked to insert a (gender and case-marked) article in a noun phrase within a sentence frame, in which condition the article must be marked for gender and case, they are far less accurate. Therefore, the authors argue for a syntactic origin of the problems in these patients.

Opposed to this view of a syntactic deficit is the theory of Bates who advocates a morphological theory of agrammatic speech. Interesting in this respect are Bates and Wulfeck’s (1989) findings in a cross-linguistic study of German and Italian. They report that article substitutions occur more often in German than in Italian. Their explanation is that German has more articles than Italian. In our view, however, the distinction between gender and case may be the critical factor here: in Italian, articles are only specified for gender, whereas in German, articles are specified for gender and for case. Therefore, more errors are expected in German, in particular when one assumes (as we do) that the origin of the substitutions is a syntactic deficit and that case is the aspect that makes articles difficult.
The present study focuses on both gender and case in Dutch and German agrammatic speech. In order to tease these two concepts apart, article substitutions on several production tasks have been analyzed. In two previous papers, one on spontaneous speech (Ruigendijk et al., 1999) and one on case assignment in two production tasks (Ruigendijk and Bastiaanse, 2002), we have demonstrated that the production of articles significantly depends on the production of case assigners. For spontaneous speech it was analyzed whether case bearing words (determiners and pronouns) were produced with or without case assigners (finite and infinitive verbs). In the experiment (the same experiment as described below) agrammatic speakers were provided with a case-assigning word (a verb) and were asked to fill in full noun phrases (nominative, dative and object NPs). Both studies conclude that if no case assigning (finite) verb is produced, articles are significantly more often omitted than when a case assigner is realized. It was therefore concluded that the problems with articles are related to the problems that agrammatic speakers have with verbs. Once the case assigner is provided, the agrammatic speaker usually produces an article. Ruigendijk and Bastiaanse (2002) also show, however, that the production of articles is not faultless. The present study focuses on the article substitutions, as these may reveal whether they are caused by problems with gender or with case, or with both.

METHODS

Subjects

Nine Dutch and ten German speakers with agrammatic Broca’s aphasia participated in this study. The Dutch group consisted of 5 men and 4 women. Their mean age was 61.3 years (range 38-78). Eight patients were right-handed and their aphasia was due to a single stroke in the left hemisphere; one patient was left-handed and his aphasia was due to a single stroke in the right-hemisphere. All Dutch aphasic speakers suffered their strokes at least nine months prior to testing (mean 60.9 months; range 9-154).

The German group consisted of 8 men and 2 women, with a mean age of 55.4 (range 29-70). They were all right-handed and aphasic due to a stroke in the left hemisphere. All of them had been aphasic for at least one year when tested (mean 79.5 months, range 13-180).

All Dutch and German subjects were diagnosed with the Aachen Aphasia test (German version Huber et al., 1983; Dutch version Graetz et al., 1992) as having Broca’s aphasia. This diagnosis was confirmed by their speech therapist and by the examiners of the tests presented here. All patients spoke in so-called telegraphic speech.

Materials

The data for the two language groups were collected in different ways. The Dutch data were elicited with a sentence construction test of 30 items (see Jonkers (1998) for an extensive description). The pictures aimed to elicit subject-
verb-object sentences. The patients were asked to say in one sentence what was happening in the picture. An example item is given in Figure 1.

For German, two different tasks were used. As these tasks were specifically meant to elicit the production of noun phrases including an article, we tried to minimize the influence of verb finding difficulties, the verb was provided in both tasks. As mentioned above, a verb is required for the production of a case-marked article. Pictures were used to elicit the target. In the first task (60 items), patients were asked to insert a noun phrase in a sentence with a finite verb. This noun phrase was the subject, direct object, indirect object of the sentence or it followed a preposition. The prepositions were subcategorized for either dative or accusative case. All nouns that had to be inserted were masculine. This was done because only for masculine nouns different articles are used for all four cases (see the paradigm for German in (3) above). The patients were asked to read the sentence aloud and to fill in the missing phrase. In the second task (50 items), patients had to construct a sentence with a given infinitive verb. The pictures of these sentences were supposed to elicit noun phrases with masculine, feminine and neuter nouns. Since we tried to avoid possible word finding problems, only highly frequent nouns were used, most of them the German equivalents of ‘man’, ‘boy’, ‘woman’, ‘girl’, ‘cat’ and ‘dog’. Notice that this

Fig. 1 – An example of the test that has been used to elicit sentence production in agrammatic speakers of Dutch. The subject is asked to tell in one sentence what is happening in the picture, for example, ‘the boy is petting the dog’.
does not necessarily help with finding the correct gender: *Das Mädchen* ‘the girl’ is neuter, not feminine. The patients were told to use the verb in its finite form, although the infinitive was given. An example of both tests is given in Figure 2.

**Analysis**

For both languages, those noun phrases that contained a noun were analyzed with respect to the production of the articles\(^3\). It was counted whether an article was produced and if so, whether this was correct with respect to gender (for Dutch and German) and case (for German). This resulted in the following error classes: (1) omissions; (2) substitutions; (2a) gender substitutions; (2b) case substitutions.

**Results**

As the error patterns in both German tasks were very similar, the results of both tasks were taken together in the error analysis. In Table I, the results are presented, the raw data are given in Appendix 1.

Overall, the Dutch patients produced 224 noun phrases. In 75 (range 1-26) of these, the article was omitted (= 33.5%). In the remaining 149 noun phrases, only 2 articles (= 1.3% on the total number of noun phrases) were incorrect with respect to gender.

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\(^3\) Sometimes, a patient produced a mass noun, which requires no article (e.g. the boy drinks milk). Such noun phrases were omitted from the analysis. Also, some pronouns were used. Although these are marked for case and gender, they were ignored in this analysis, because the study focuses on the production of articles.
Together, the German patients produced 1590 noun phrases. In 154 of these, the article was omitted (=9.6%). One of the patients is responsible for 105 of these omissions; the other patients omit between 0 and 18 articles. Of the produced 1375 articles, 233 were substitutions (=14.6% of the total number of noun phrases; range 10-39).

When the Dutch and German omission versus substitution patterns are compared, a significant difference shows up: where the Dutch agrammatic speakers tend to omit, the German agrammatic speakers tend to substitute the articles ($\chi^2 = 82.98$, df = 1, $p < 0.001$).

Of these substitutions in German, 26 were gender errors (=1.8% on the total number of noun phrases) and 204 were case errors (=12.8% on the total number of noun phrases); 3 articles were incorrect with respect to both case and gender. This means that 87.6% of the substitutions were case errors and 11.1% were gender errors. This difference is significant ($t = 8.05$, df = 9, $p < 0.001$). The case errors were predominantly dative and accusative exchanges (accusative $\rightarrow$ dative 22.5%; dative $\rightarrow$ accusative 59.3%). There is no clear error pattern for the gender errors in German; in Dutch, the neuter article *het* was substituted by *de* in both errors.

### DISCUSSION

The results show that both Dutch and German agrammatic speakers have problems with the production of articles, resulting in omissions and substitutions. Two points are of interest here. First, there is the different error pattern in Dutch and German with respect to omissions and substitutions; second, there is the German error pattern with respect to gender and case.

Agrammatic Dutch speakers tend to omit rather than substitute articles, whereas the agrammatic German speakers show the opposite pattern. The difference between the Dutch and German data is even more pronounced when it is taken into consideration that 68% of the omissions in German occurred in one patient.

It may be argued that the difference is a task-specific consequence. In the Dutch task, the subject was asked to construct a sentence with a picture, whereas...
in German, for both tasks, the verb – which is supposed to assign case to the noun phrase – was provided. Reanalysis of the data reveals that the agrammatic Dutch speakers omitted the article in 15.2% of the noun phrases when they did produce a case assigner, which is comparable to the 9.6% of omissions in the German-speaking population, for whom the case assigner was provided. This suggests that the difference between the agrammatic Dutch and German speakers is not in the proportions of article omissions, but rather in the proportions of article substitutions.

The data reveal that there is a remarkably low number of gender substitutions, both in Dutch (0.9%) and in German (1.8%). The most interesting difference between the Dutch and German agrammatic speakers concerns the case substitutions. In German these constitute more than 50 percent of the total number of omissions and substitutions. We therefore conclude that the different error patterns observed in the Dutch and the German agrammatic speakers are due to the relatively large number of case substitutions in German, an error that cannot be made in Dutch.

Ruigendijk and Bastiaanse (2002) discuss the pattern of article omissions on the same tasks and argue that these omissions are strongly related to the presence of a case assigner in both languages: when a case assigner is produced, the number of omissions drops significantly. The present study focuses on the article substitutions and it shows that these are primarily caused by case errors. Together, these studies demonstrate that both omissions and substitutions of articles are caused by a syntactic concept, that is, case. When there is no case assigner (for example a verb or a preposition), articles tend to be omitted, because of the syntactic dependency between the case assigner and the article. When an article is substituted, this is most often a case error: the incorrect case is produced and this is usually an accusative for a dative or the other way around, meaning that the case assigner assigns the incorrect case, again a syntactic error.

Gender errors are rare: less than 2% of the noun phrases are produced with an incorrect article with respect to gender. This shows that when the correct word form is retrieved from the lexicon, the correct information on gender tags goes along, even in Dutch and German, in which the word form does not reveal information about the gender of the word.

The conclusion that gender information of nouns is not impaired in agrammatic Broca’s aphasia is in line with the results of De Bleser et al. (1996) for German and Luzzatti and De Bleser (1996) for Italian. De Bleser et al. (1996) also show that in agrammatic production, articles are more prone to errors when the noun phrase must be used in a sentence (when case should be assigned) than when a noun phrase must be used in isolation. This supports our hypothesis of a syntactic deficit.

As mentioned in the Introduction, Bates and Wulfeck (1989) claim that agrammatic Italian speakers produce fewer article substitutions than agrammatic German speakers, which corresponds to the difference we found between Dutch and German agrammatic speech. Bates and Wulfeck (1989) explain their results by the larger number of articles that is available in German compared to Italian, but our analysis shows that there is more at stake: it is not the number of articles, but the nature of the information that is provided by the article; lexical...
information (gender) is intact, whereas German agrammatic speakers are impaired in their ability to express syntactic information (case) contained in the article.

In conclusion, we argue that agrammatic Broca’s aphasia is a deficit that affects the ability to encode syntactic information. Therefore, we predicted that gender, which is assumed to be lexical rather than syntactic in nature, would be relatively unaffected in agrammatic production, whereas case, a syntactic concept, would be impaired. The pattern of article substitutions as produced by agrammatic Dutch and German speakers on several production tasks supports our hypothesis: more than 85% of the article substitutions are case errors and hence, syntactic by nature. Articles are not simply omitted and substituted in agrammatic speech: they are highly selectively omitted (that is, in the absence of a case assigner) and highly selectively substituted (case but no gender substitutions).

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### APPENDIX 1

*Raw Scores of the Agrammatic Dutch (D1-D9) and German (G1-G10) Speakers*

<table>
<thead>
<tr>
<th></th>
<th>Omission</th>
<th>Substitution</th>
<th>Double</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Gender</td>
<td>Case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>26</td>
<td>0</td>
<td></td>
<td></td>
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<tr>
<td>D3</td>
<td>3</td>
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<td></td>
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<tr>
<td>D4</td>
<td>19</td>
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<tr>
<td>D5</td>
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<tr>
<td>D6</td>
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<tr>
<td>D9</td>
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<tr>
<td>Total Dutch</td>
<td>75</td>
<td>2</td>
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<td></td>
</tr>
<tr>
<td>G1</td>
<td>12</td>
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