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Identifying German–English cognates, false cognates, and non-cognates: methodological issues and descriptive norms*

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We investigated 563 German–English nouns for the purposes of identifying cognates, false cognates and non-cognates. Two techniques for identifying cognates were used and compared: (i) De Groot and Nas's (1991) similarity-rating technique and (ii) a translation-elicitation task similar to that of Kroll and Stewart (1994). The results obtained with English-speaking participants produced 112 cognates, 94 false cognates, and 357 non cognates and indicated that the two techniques yielded similar findings. Rated similarity of German–English translation pairs and translation accuracy were positively correlated. We also investigated whether the presence of German-specific characters and the availability of German pronunciation information influenced similarity ratings and translation accuracy. Ratings for translation pairs in which the German word contained a language-specific character were lower and the word was translated less accurately. Participants provided with pronunciation information rated German–English translation pairs as being more similar and translated German words correctly more often than participants who did not receive pronunciation information. We also report the relationships among word frequency, rated imageability and the performance measures. The resulting database of information is intended to be a resource for researchers interested in cognitive processing in German–English bilinguals.

As many students of a second language can attest, translation equivalents in two languages often resemble one another. For example, in the Dutch–English pair "Appel–Apple", the translation equivalents are similar in appearance and sound. Such translation pairs are typically called cognates. Cognates are not uncommon across languages, particularly when the two languages belong to the same language family. Lobo (1966, cited in Meara, 1993) estimated that there are approximately 3,000 English–Spanish cognates. Séguin and Tréville (1992, cited in Meara, 1993) reported that there are approximately 6,500 English–French cognates which are orthographically identical (homographic cognates), and 17,000 English–French cognates which are not orthographically identical, but are spelled and pronounced similarly (non-homographic cognates). Cognates can also be found in languages that are historically unrelated. When speakers from such languages have contact with one another over a period of time, cognates may occur in the two languages because of borrowing or "loan words". For example, "filter" and "pyramid" are borrowed words in Hebrew (Gollan, Forster and Frost, 1997), and "baseball" and "ice cream" are borrowed words in Japanese (Hatta and Ogawa, 1983).

Recent studies have shown that language learners find it easier to acquire cognate translations. Participants with no prior knowledge of the to-be-learned language recall a higher percentage of cognates than non-cognates, achieve a high level of recall in fewer learning sessions for cognates than non-cognates, and yield faster response latencies in translating cognates than they do for non-cognates (De Groot and Keijzer, 2000; Ellis and Beaton, 1993; Lotto and De Groot, 1998). Cognates have also become a special interest of researchers studying how linguistic knowledge, specifically lexical knowledge, is organized in bilingual memory and accessed during language processing. In a continued free-association task with French–English bilinguals, Taylor (1976) found that English and French cognate translations (e.g., "carrot" and "carotte") elicited common

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primary associates (''vegetable'' and ''legume'', respectively) more often than did non-cognates. In addition, the response lists for cognates had greater total overlap than did those for non-cognates. Van Hell and De Groot (1998a) obtained similar results with Dutch–English bilinguals. Participants were instructed to provide an associated word in the same language (e.g., English) and in the other language (e.g., Dutch) to a presented word. For cognates, associates were more frequently translations of one another than they were for non-cognates. In addition, associates for cognates were easier to generate than those for non-cognates. In categorization tasks, second-language cognates are categorized more quickly and more accurately than are non-cognates (Dufour and Kroll, 1995). Bilinguals also access second-language cognates faster than second-language non-cognates, as indicated by response times in a lexical decision task in which participants provide a ''yes'' response if a letter string forms a word in either language (Caramazza and Brones, 1979; Dijkstra, Van Jaarsveld and Ten Brinke, 1998, Experiment 1). Kroll and Stewart (1994) showed that the composition of stimulus lists could influence results in naming tasks, as they obtained a reversal in the pattern of response latencies between categorized and randomized lists. Cognates were named faster than non-cognates in randomized lists, whereas non-cognates yielded faster responses in the categorized lists. The authors argued that the latter result might have been due to a conflict in computing the cognate's pronunciation. Although cognates are similar in appearance to their translation, the lexical representations map onto different phonological representations, leading to delays in naming responses.

Cognates have also shown advantages over non-cognates in many studies involving translation tasks. When bilinguals are asked to translate from their first language (L1) to their second (L2), they translate cognates faster, provide more responses to cognates, and provide correct responses to cognates more often than to non-cognates (De Groot, 1992; De Groot and Poot, 1997; Kroll and Stewart, 1994). In cued translation tasks, where participants are provided with the first letter of the correct translation, L2 to L1 translation is typically faster than L1 to L2 translation when non-cognates are used (De Groot, Dannenburg and Van Hell, 1994; Sánchez-Casas, Davis and García-Albea, 1992). However, translation times for cognates have also been found to be equal regardless of translation direction (De Groot et al., 1994; Sánchez-Casas et al., 1992). The cognate advantage has also been observed in translation recognition tasks (where participants are presented with a word from each language and are instructed to decide whether the two words form a translation pair), as bilinguals make faster and more correct decisions for cognate pairs than for non-cognate pairs (De Groot and Comijs, 1995).

Other advantages for cognates have been found in the translation priming literature. In the translation-priming paradigm, a priming effect is said to occur when presentation of a word (the prime) in one language facilitates recognition of its translation (the target) when presented later (usually several minutes to a half-hour later) relative to its presentation after an unrelated word. Most studies have shown that strong translation-priming effects occur for cognates (e.g., Gerard and Scarborough, 1989), and this effect even occurs when there are several intervening items between the prime and target (Cristoffanini, Kirsner and Milech, 1986). For non-cognates, many studies have shown that translation-priming effects are weaker than those for cognates or are non-existent (e.g., Kirsner, Smith, Lockhart, King and Jain, 1984; Larsen, Fritsch and Grava, 1994; Scarborough, Gerard, and Cortese, 1984; Watkins and Peynircioglu, 1983). This latter pattern is by no means universal, however, as robust non-cognate priming effects have been found when auditory stimuli are used (e.g., De Bot, Cox, Ralston, Schaufeli and Weltens, 1995; Woutersen, Cox, Weltens and De Bot, 1994; Woutersen, De Bot and Weltens, 1995), when the prime and target are presented with short stimulus onset asynchronies (SOA; e.g., Keatley and De Gelder, 1992; Keatley, Spinks and De Gelder, 1994; Schwanenflugel and Rey, 1986) and with stimuli in which different alphabetic scripts are used (e.g., Brown, Sharma and Kirsner, 1984; Chen and Ng, 1989). Strong priming effects for cognates have also been obtained when the prime is presented for a brief duration, masked such that it is not available for conscious report, and presented immediately before presentation of the target (e.g., De Groot and Nas, 1991; Friel, 1999; Gollan et al., 1997; Sánchez-Casas et al., 1992). Cognate priming effects as large as those for repetition priming (where the prime and target are the same word) have also been found in studies using this methodology (García-Albea, Sánchez-Casas, Bradley and Forster, 1985, cited in Gollan et al., 1997; Sánchez-Casas et al., 1992). Furthermore, De Groot and Nas (1991) obtained cross-language semantic priming effects (e.g., RIVIER priming WATER) for cognates, and these effects were as large as were those for within-language semantic priming effects (De Groot and Nas, 1991; but see Grainger and Frenck-Mestre, 1998, for similar results with non-cognates).

The fact that cognates more often yield different

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results than non-cognates in these tasks has led researchers to propose that lexical representations for cognates are stored differently than those for other words. De Groot and Nas (1991) proposed that cognate translations share a common conceptual representation, whereas non-cognate translations have their own language-specific conceptual representations. In their study, they provided evidence for this theory by finding cross-language semantic priming for cognates, but not for non-cognates. Alternatively, Sánchez-Casas et al. (1992) suggested that cognate translations might share a common representation at the lexical level, whereas non-cognates have separate lexical representations for each translation. Evidence for this conceptualization of bilingual lexical representation comes from experiments demonstrating that cross-language priming effects for cognates were equivalent to repetition priming effects (García-Albea et al., 1985, cited in Gollan et al., 1997; Sánchez-Casas et al., 1992). Finally, Kirsner, Lalor and Hird (1993) proposed a third model of bilingual lexical representation, which maintains that words with common morphology are stored together in clusters. This model goes beyond the previous two in that it incorporates other morphologically related words and not just cognate translations. Because cognate translations have a common root morpheme, they are stored within the same morphological cluster, regardless of language (e.g., the French words ''marier'', ''mariage'', ''mariable'', would be stored in the same cluster as ''marry'', ''marriage'', ''married''). In the case of non-cognates, the translations have different root morphemes and are stored in different clusters. Evidence for this model comes from Cristoffanini et al. (1986), who demonstrated that cross-language priming effects for cognates had qualities that were consistent with within-language morphological priming. Their finding of a lack of non-cognate priming is also consistent with this model. If non-cognates are stored in separate morphological clusters, then in cross-language priming the prime and target would activate different clusters and no transfer would take place.

Despite the growing interest in cognates and the growing empirical literature related to the storage and processing of cognates, Grosjean (1997, 1998) has pointed out that there is still confusion related to the definition of a cognate. Although most would agree that cognates are translations similar in sound and appearance, few have explicitly defined what they mean by ''similar''. When it has been defined, several definitions have been used. For example, Sánchez-Casas et al. (1992) defined their Spanish–English cognates as those translations having a common original root word. Similarly, Gollan et al. (1997) defined their cognates as those translations in which Hebrew words were borrowed from English. De Groot and Nas (1991) took another approach and asked Dutch–English bilinguals to rate Dutch–English translations on a scale from 1 to 7 in terms of similarity in sound and spelling to corroborate the translation pairs they labeled cognates in a previous experiment. In all but one case, the translation pairs they labeled cognates were rated higher than the pairs they labeled non-cognates. Kroll and Stewart (1994) developed another method for identifying cognates. Native English speakers with no knowledge of Dutch or German were asked to translate a list of Dutch words. Because Dutch and German are closely related languages and share many cognates, it was important that participants had no knowledge of German since such knowledge would presumably have allowed them to guess the correct translations of many of the Dutch words that did not resemble their English counterparts. The lists were categorized into semantic clusters, and the label for the category appeared in English above each cluster. Similarity between the Dutch and English words had to be salient enough for English monolinguals to link the unknown Dutch word to the correct English translation. Words that were correctly translated by more than 50% of the participants were treated as cognates. Dufour and Kroll (1995) also used this method to identify their French–English cognate pairs.

With this translation-elicitation technique, it is also possible to identify words that are translated incorrectly with the same incorrect translation a high percentage of the time. Such word pairs have been called ''false cognates'' (e.g., Brysbaert, 1998; Dijkstra et al., 1998; French and Ohnesorge, 1997; Gerard and Scarborough, 1989; Grainger, 1993). False cognates, sometimes referred to as ''interlingual homographs'' (Klein and Doctor, 1992), ''homographic non-cognates'' (Gerard and Scarborough, 1989), ''false friends'' (Meara, 1993), ''pseudocognates'' (De Groot and Comijs, 1995) or ''misleading cognates'' (Taylor, 1976), are words from each of two languages that resemble one another but have different referents (e.g., ''four'', meaning ''oven'' in French, would be an example). False cognates are of interest to psycholinguistic researchers, because they provide an effective control condition in translation-priming studies. If enhanced priming effects are found for cognates and not for false cognates, then one can be confident that the effect is not due strictly to the prime and target overlapping in form. The investigations that have been conducted have, thus far, yielded mixed results (see De Bot et al., 1995; Friel, 1999; Gerard and Scarborough, 1989; Sánchez-

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Casas et al., 1992). In a recent study using false cognates as a control condition, Kambe, Altarriba, Pollatsek and Rayner (2000) demonstrated that orthographic, and not semantic, information in the parafovea is processed during reading. Spanish–English bilinguals read English passages while their eye movements were tracked. Using an eye-contingent display technique (Balota, Pollatsek and Rayner, 1985; Rayner, Balota and Pollatsek, 1986), the authors varied the semantic and orthographic relationship between a Spanish "preview" word presented in the parafoveal region and an English target word that the preview word changed to just before eye fixation. Cognate translations (e.g., CREMA–CREAM) and false cognate pairs (GRASA, meaning "grease", and GRASS) yielded shorter gaze durations than did non-cognates (e.g., FUERTE–STRONG) and controls. Because gaze durations for non-cognate pairs did not differ from controls, and cognate and false cognate pairs did not differ from one another, the authors argued that readers benefited from the orthographic similarity of the preview word to the target and not from any semantic similarity between the two.

False cognates have also been used to investigate bilinguals' performance in translation-recognition tasks. Participants typically take longer to reject false cognate pairs (e.g., HOUT, meaning "wood" in Dutch, and HOUSE) as legitimate translation pairs and make more errors than they do when compared with other unrelated word pairs (De Groot and Comijs, 1995). Similarly, translation-recognition studies, in which one word is orthographically similar to the correct translation in non-translation pairs (e.g., HAMBRE, meaning "hunger", presented instead of HOMBRE as the translation of MAN), have shown that participants yield longer response times and higher error rates for such pairs when compared with unrelated word pairs (Altarriba and Mathis, 1997; Talamas and Kroll, 1993, cited in Altarriba and Mathis, 1997; Talamas, Kroll and Dufour, 1999). In addition, correct translation pairs involving an interlingual homograph (i.e. a false cognate such as GLAD–SLIPPERY), requiring a "yes" response, have been shown to yield longer response latencies and higher error rates (De Groot, Delmaar and Lupker, 2000, Experiment 1).

False cognates have also been of interest to researchers investigating the word recognition process in bilinguals and the relative activation levels of each lexicon, as many recent studies have used interlingual homographs (e.g., Beauvillain and Grainger, 1987; De Bot et al., 1995; De Groot et al., 2000; Dijkstra, De Bruijn, Schriefers and Ten Brinke, 2000; Dijkstra, Grainger and Van Heuven, 1999; Dijkstra, Timmermans and Schriefers, 2000; Dijkstra et al., 1998; Doctor and Klein, 1992; Gerard and Scarborough, 1989; Klein and Doctor, 1992). Depending on the experimental task and composition of the stimulus list, interlingual homographs may be processed differently from other words (De Groot et al., 2000; Dijkstra et al., 1998; Dijkstra, De Bruijn, et al., 2000; Dijkstra, Timmermans and Schriefers, 2000). When participants are asked to perform a single-language lexical decision task in which they are instructed to respond "yes" only to words in a target language and "no" to all other stimuli, response times to interlingual homographs do not differ from those of controls (i.e., words with spellings corresponding only to the target language) when no words from the non-target language other than interlingual homographs are included as stimuli (Dijkstra et al., 1998, Experiment 1; Dijkstra, De Bruijn, et al., 2000; Gerard and Scarborough, 1989). Furthermore, word-recognition times depend on the target-language frequency, and not on the frequency of the non-target language or summed frequency (Gerard and Scarborough, 1989). However, if the stimulus list includes non-homographic words from a non-target language, response times to interlingual homographs are typically longer than are those for control words (i.e., letter strings corresponding to words found only in the target language) when participants are instructed to treat words from the non-target language as non-words. In addition, studies using mixed-language lists generally yield interference effects that are dependent on the word frequency of each language (De Groot et al., 2000, Experiment 3; Dijkstra et al., 1998, Experiment 2; Dijkstra, De Bruijn, et al., 2000; Dijkstra, Timmermans and Schriefers, 2000). The authors of these studies argued that the composition of stimulus lists presented to bilingual participants plays a role in the relative activation levels of each lexicon (Dijkstra et al., 1998; Dijkstra, De Bruijn, et al., 2000; Dijkstra, Timmermans and Schriefers, 2000) or that it influences participants' subconscious processing modes (De Groot et al., 2000).

Klein and Doctor (1992) found that response times in a general lexical decision task for interlingual homographs (false cognates) between English and Afrikaans (e.g., "Kind" which means "child" in Afrikaans) were significantly longer than were those for homographic cognates (e.g., "Hand"). The authors suggested that the slower response times to interlingual homographs were due to interference between competing semantic representations corresponding to each language ("benevolent" for English and "child" for Afrikaans). With homographic cognates, no such interference occurs, because only one semantic representation is activated. Although no

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control condition using form-unrelated pairs was reported in the Klein and Doctor (1992) study, the authors provide data that may suggest that the orthographic similarity between homographic words (cognates and non-cognates) from each language still offers an access advantage, as a statistically non-significant trend for response times to interlingual homographs being faster than those for words specific to English or Afrikaans was found in a generalized lexical decision task. Furthermore, Dijkstra et al. (1998, Experiment 3) obtained similar findings that were statistically significant.

False cognates are also of interest to educators, because these are words that can cause problems for second-language learners (Meara, 1993). For the learner, knowledge of the native language could actually interfere with second language learning, because knowledge of L1 words that look and sound similar to the new L2 word may compel the learner to assume that they mean the same thing. This is an appropriate assumption when encountering cognates and can lead to great strides in L2 vocabulary acquisition. However, it can mislead the learner when false cognates are encountered. Once an inappropriate association is learned, it may become more difficult for the language learner to form the correct association than it would be with translations that differ in sound and appearance. Error rates for such stimuli in the translation-recognition studies described above support this contention (Altarriba and Mathis, 1997; Talamas and Kroll, 1993, cited in Altarriba and Mathis, 1997; Talamas et al., 1999).

The purpose of the present investigation was to identify German–English cognates and false cognates, thereby distinguishing them from non-cognates. We used both the similarity-rating technique of De Groot and Nas (1991) and a modified version of the translation-elicitation task of Kroll and Stewart (1994). We were interested in whether the two techniques yield comparable results. If so, then the similarity ratings of German–English translation pairs should positively correlate with translation accuracy. All of our participants, who reported having no learning experience with German, were native speakers of American English. In the similarity-rating task, participants were asked to rate the similarity of translation pairs on a seven-point scale (1 = "Low similarity" and 7 = "High Similarity"). Traditionally, participants with knowledge of both languages have provided the similarity ratings in studies using this method (e.g., De Bot et al., 1995; De Groot, 1992; De Groot and Comijs, 1995; De Groot et al., 1994; De Groot and Nas, 1991; Lotto and De Groot, 1998; Woutersen et al., 1994). Although participants in these studies were instructed to base their ratings on overlapping sound and appearance between translation pairs, the use of monolingual participants in the present study offers a higher degree of certainty that similarity ratings will be based on form overlap, as monolinguals cannot be influenced by the meaning of the word in the unknown language. In contrast, when bilinguals provide similarity ratings, it is possible that varying degrees of meaning overlap between translation pairs may influence their judgments.

In the translation elicitation task, a different group of participants was asked to translate a series of German nouns. Rather than semantically categorizing the list of words as Kroll and Stewart did, we presented our lists in randomized order. We recognize that words are generally encountered in contexts that allow one to infer their respective meanings based on surrounding words and the settings in which they occur. Although presenting these words in a random order may limit the generalizability of our results, we feel there are several advantages to presenting our stimuli in such a fashion. The primary motivation for randomizing our lists was that many of the words in the list referred to abstract concepts and would be difficult to categorize into meaningful semantic clusters. A second, and equally important, reason was that it enabled us to identify which words were false cognates. With the randomized version of the Kroll and Stewart (1994) cognate method, one can find these false cognates by analyzing participants' incorrect answers. If a given word elicits a single incorrect response frequently (e.g., "Four" as an answer to the French word "four" when the correct response would be "Oven"), it could be considered a false cognate. However, if one categorizes the list of stimuli, the likelihood of getting incorrect responses that are orthographically similar to the target word is reduced considerably. For example, non-French speakers would be unlikely to provide "Four" as a response to "four" if the French word were categorized into a semantic cluster labeled "Kitchen Appliances". Lastly, we randomized our lists because we reasoned that providing semantic information in the form of organizing lists in semantic categories would provide participants with information that they might use to guess translations through a process of elimination. For example, Dutch "citroen" and English "lemon" were found to be cognate translations by Kroll and Stewart. It seemed unlikely to us that monolingual participants would have correctly translated "citroen" as "lemon" more than 50% of the time had they not been able to provide translations for many other members of the fruit category.

Many of the German words selected for the study

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contained alphabetic characters not found in the English alphabet: three umlauted vowels (ä, which sounds like the "a" in "late" or "e" in "bed"; ö, which sounds like the "er" sound, but with the lips rounded; and ü, which sounds like the long "e" sound, but with the lips rounded) and the esszet (ß, which sounds like "ss"). This factor (henceforth called Orthography) allowed us to compare similarity ratings for pairs in which the German word contained an umlauted vowel and/or an esszet with pairs without such characters. The same comparison was made for accuracy in the translation-elicitation task. We expected participants to rate word pairs containing characters not found in English to be less similar than those without these characters. In the translation-elicitation task, we predicted that participants would translate nouns with umlauted vowels and/or esszets less accurately than other nouns.

We also attempted to assess the impact that knowledge of pronunciation has on English monolinguals' ability to rate the similarity of German–English translation pairs and to translate German nouns. Because some researchers have used phonological similarity as a defining characteristic of cognate pairs, we felt it was important to understand whether providing participants with pronunciation information would influence how cognates and false cognates can be identified. In the present research, we varied the type of instructions that participants received by using a pronunciation guide (this factor is henceforth called Guide). Participants either received the task instructions along with the pronunciation guide (PG) or they received the task instructions alone (NPG). Our pronunciation guide included information about German characters not found in the English alphabet along with letters and letter combinations found in both English and German that are pronounced differently in the two languages (e.g., "j" is pronounced as a "y" sound in German). We expected participants who received pronunciation information to rate German–English translation pairs as more similar than those who did not receive pronunciation information. In the translation-elicitation task, we expected participants who received pronunciation information to provide more correct translations than those who did not receive pronunciation information. Furthermore, we predicted an interaction between the two factors (Guide and Orthography) in both tasks, as we expected participants receiving the pronunciation guide to benefit more than other participants when encountering German words with non-English characters (as opposed to words with shared characters). Participants not receiving the pronunciation guide were expected to rate as less similar translation pairs where the German words had non-English characters and have a particularly difficult time translating these German words, because they were assumed to have no prior knowledge of the pronunciations of these letters. For other words, we expected less of a difference in performance between participants in each condition.

Our expectations about the possible role of pronunciation information in the translation-elicitation task, in particular, appear to be supported by an investigation reported by Durso and Shore (1991), who demonstrated that when native English speakers encounter unknown English words, they are frequently able to perform above chance in deciding whether they are in a syntactically correct context. They suggested that when participants encountered an unknown word, lexical neighbors that relate to the unknown word in terms of sound and meaning became active, allowing participants to use that information to make their judgments. Similarly, in the translation-elicitation task, unknown German words could activate certain English words because of similarities in sound, making it more likely that the activated English words would be provided as responses.

We also explored two word characteristics and their respective relationships with a word's status as a cognate, false cognate or non-cognate: imageability (Paivio, Yuille and Madigan, 1968) and printed word frequency. Researchers using our database may wish to consider these variables in selecting stimuli, as they have been shown to influence performance in a number of bilingual tasks. Imageability was of interest because some models of bilingual lexical representation postulate that, at least for proficient bilinguals, translation pairs share all or part of a conceptual representation (see e.g., Chen and Leung, 1989; De Groot, 1992; De Groot and Nas, 1991; Kroll and Stewart, 1994; Potter, So, Von Eckardt and Feldman, 1984). De Groot (1992) argued that the degree to which a translation pair shares a conceptual representation depends on whether or not the words refer to an abstract concept. That is, a translation pair referring to an abstract concept (e.g., "idea") shares less of the conceptual representation than does a translation pair referring to a more concrete concept (e.g., "train"). One measure that has been commonly used to reflect this dimension is imageability (e.g., De Groot, 1992; De Groot et al., 1994; De Groot and Keijzer, 2000; Van Hell and De Groot, 1998b). Imageability ratings were included in this study because it has been shown to influence bilingual performance in tasks such as translation and cross-language priming (De Groot et al., 1994; Jin, 1990). In our research, a different group of participants rated the imageability of the English

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words on a seven-point scale (1 = "Low Imagery" and 7 = "High Imagery"). Because previous research has shown imageability and cognate status to be positively correlated (e.g., De Groot, 1992, Experiment 3), we predicted that both similarity ratings of German–English translation pairs and translation accuracy would be positively correlated to imageability ratings. As for word frequency, it has been studied extensively in the bilingual literature (e.g., De Groot, 1989, 1992; De Groot et al., 1994; De Groot and Keijzer, 2000; Lotto and De Groot, 1998). In De Groot's (1992) study, she obtained weak positive correlations between similarity ratings for Dutch–English pairs and English word frequency (+.13) and Dutch word frequency (+.10). In the present study, similar correlations with word frequency are predicted for the similarity rating and translation-elicitation tasks.

Method

The research was carried out in four stages. The first stage involved the selection of the German–English word pairs and the creation of the two randomized lists of words or word pairs. The three following stages involved the collection of data in the similarity-rating task, the translation-elicitation task and the imageability-rating task. Each of 250 participants completed only one of these three tasks.

Participants

Two hundred and fifty undergraduates at the University of Oklahoma took part in the study. They were native speakers of American English and they indicated that they had never learned German or any other Germanic languages (other than English). One hundred took part in the similarity-rating task, another 100 participated in the translation-elicitation task, and the remaining 50 took part in the imageability-rating task. All of them participated in exchange for course credit.

Materials

Initially, 569 German nouns were selected from German education textbooks (Crean, Scott and Briggs, 1993; Dippman, 1995; Moeller, Liedloff, Adolph, Hoecherl-Alden, Kirmse and Lalande, 1996; Vail and Sparks, 1986) and issues of *Der Spiegel*, a popular German news-magazine. An effort was made to include nouns containing at least one German-specific character, such as an umlauted vowel or esszet. Of the 569 nouns, 159 contained at least one of these characters. In order to lessen the participants' workload, a single randomized list of the 569 nouns was divided into two lists (Lists 1 and 2), each containing 285 nouns (one noun, "Kompromiß", was included in both lists so that the lists contained the same number of items). One consequence of this was an unequal number of nouns with German-specific characters in each list (List 1 = 84, List 2 = 75). The order of items was then changed such that five easily translatable German nouns, as judged by the experimenters, began each list. This was done to enable participants to begin the similarity-rating and the translation-elicitation tasks with confident responses. We constructed a pronunciation guide for both tasks that detailed the pronunciation differences between German and English. It was based on a German phrase book for non-German speakers (Norman and Hitchin, 1988) and it is provided in Appendix 1.

Procedure

The following procedure was used in the three tasks.

Similarity-rating task

Each German noun was accompanied by its English translation. Participants received the following instructions before each list:

> Translations between the words of two languages differ in how similar they are. Some translations are nearly identical (as happens quite often in related languages such as Spanish and French). The purpose of this experiment is to rate a list of German–English translation pairs on how similar they are. The German word will be printed on the left with its English translation to its right. Any translation pair which, in your estimation, is made up of words that are very highly similar should be given a *very high similarity* rating; any translation pair that is made up of words that are not highly similar, in your estimation, should be given a *very low similarity* rating. Consider the translation pair "Kanal–Canal". "Kanal" and "Canal" are very similar and would probably be rated as very high in similarity. Consider the translation pair "Sarg–Coffin". "Sarg" and "Coffin" would probably be rated as very low in similarity.
>
> Your ratings will be made on a seven-point scale, where *one* is the very low similarity end of the scale and *seven* is the very high similarity end of the scale. Make your rating by putting a circle around the number from 1 to 7 that best indicates your judgment of the similarity of the translation pairs. The translation pairs that are identical or very nearly identical should be given a rating of 7; translation pairs that are not similar at all should be rated 1; words that are intermediate in similarity, of course, should be rated appropriately between the two extremes. *Please use the entire range of numbers*, from 1 to 7; at the same time, don't be concerned about how often you use a particular number *as long as it is your true judgment*. Work fairly quickly but do not be careless in your ratings.

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Four examples were presented below the instructions. Participants either received the pronunciation guide or did not and received one of two lists. This resulted in four groups: List 1 with or without the pronunciation guide, and List 2 with or without the guide. Twenty-five participants completed each list/guide combination for a total of 100 participants.

Translation-elicitation task

The instructions that appeared before each list were as follows:

On the following pages, there is a list of German nouns. Your task is to try to guess the English translation for each. Please write your guess in the blank. Consider the example below:
Auto _____
You might have guessed that the English translation is "Car" or "Auto". This guess is correct. The word "Auto" in German refers to the same thing as the word "Car" refers to in English. It is important that you make the best guess that you can. You may find it difficult to guess for some of the nouns. Please write down one guess for each noun no matter how uncertain you might be. When you are done, please look back over your answers to make sure that you did not skip any items.

Once again, participants either received the instructions alone or along with the pronunciation guide. Combining the two lists with the two types of instructions yielded four list groups, with 25 different participants per group, for a total of 100 participants (all different from those used with the first task).

Imageability-rating task

The same lists and order within lists were used as in the similarity-rating and the translation-elicitation tasks. The lists contained only the English words, followed by a seven-point rating scale (1 = "Low Imagery" and 7 = "High Imagery"). Participants received the following instructions:

Nouns differ in their capacity to arouse mental images of things or events. Some words arouse a sensory experience, such as a mental picture or sound, very quickly and easily, whereas others may do so only with difficulty (i.e., after a long delay) or not at all. The purpose of this experiment is to rate a list of words as to the ease or difficulty with which they arouse mental images. Any word which, in your estimation, arouses a mental image (i.e., a mental picture, or sound, or other sensory experience) very quickly and easily should be given a *high imagery* rating; any word that arouses a mental image with difficulty or not at all should be given a *low imagery* rating. Think of the words "elephant" and "chance." "Elephant" would probably arouse an image relatively easily and would be rated as high imagery; "chance" would probably do so with difficulty and would be rated as low imagery. Since words tend to make you think of other words as associates, e.g., "knife-fork," it is important that you note only the ease of getting a mental image of an object or an event to the word. Your ratings will be made on a seven-point scale, where *one* is the low imagery end of the scale and *seven* is the high imagery end of the scale. Make your rating by putting a circle around the number from 1 to 7 that best indicates your judgment of the ease or difficulty with which the word arouses imagery. The words that arouse mental images most readily for you should be given a rating of 7; words that arouse images with the greatest difficulty or not at all should be rated 1; words that are intermediate in ease or difficulty of imagery, of course, should be rated appropriately between the two extremes. *Please use the entire range of numbers*, from 1 to 7; at the same time, don't be concerned about how often you use a particular number *as long as it is your true judgment*. Work fairly quickly but do not be careless in your ratings.

Four examples were presented following the instructions. Unlike the previous tasks, only two list conditions were used. The fact that all stimuli were in English rendered unnecessary a pronunciation guide manipulation. Fifty additional participants completed each of the two lists (25 per list).

Results and discussion

The data were collapsed across lists. In addition, several items appearing in the questionnaires were not included in the statistical analyses due to various errors: "Studentenheim", "Anzug", "Uhr", "Vogel", "Golf", and "Rock". One item appeared in two lists ("Kompromiß") and so the data for the second appearance of this item was not included in the statistical analyses. The analyses concerned 563 words therefore. Items that were inadvertently skipped by participants were eliminated from the analyses, resulting in a loss of less than 1 percent of the data. Mean similarity and mean imageability ratings were calculated for each word pair or each word. Participants' responses in the translation elicitation task were scored in the following manner. Items that were left blank were counted as incorrect. Misspellings were counted as correct if there was a reasonable correspondence with the correct translation (i.e., it looked and sounded like the correct translation, and did not more closely resemble another word). If the misspelling corresponded to a homophone of the correct answer, it was counted as incorrect. Plural versions and exact synonyms (e.g., "sofa" and "couch") of the correct answer were also counted as correct. Incorrect translations were examined in order to determine the most frequent incorrect translations. Misspellings and plurals were

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handled in the same manner as correct translations that were misspelled.

In Appendices 2–4, we display the summary statistics for the 563 nouns retained. The English–German translation pairs have been divided among three tables such that Appendix 2 displays the 112 pairs identifiable as cognates (19.9% of the total); we used Kroll and Stewart's (1994) criterion of a correct translation at least 50% of the time (in at least one of the two Guide conditions) for a pair to be considered cognates. Appendix 3 displays 94 pairs identifiable as false cognates (16.7% of the total); they were incorrectly translated with the same incorrect translation at least 50% of the time. And Appendix 4 displays the 357 non-cognates (63.4% of the total) – those remaining pairs from the studies identifiable as neither cognates nor false cognates. Each table is organized as follows: the correct English translation of the German word, the German word itself, the lemma frequency per million[1] for both the English words (E; as assessed by Francis and Kucera, 1982) and the German words (G; as assessed by the CELEX database of Baayen, Piepenbrock and Van Rijn, 1993), the mean imageability rating for the English translation, the mean similarity rating for the English–German translation pair (when the pronunciation guide was provided (PG) and when it was not provided (NPG)), the number of correct translations in the translation-elicitation task (PG and NPG; the maximum is 25) and the incorrect translations provided in the translation-elicitation task (again PG and NPG; here too the maximum is 25).

Having identified the cognates, false cognates and non-cognates in the words tested (as presented in the appendices), we turned to the relationship between performance in the similarity-rating task and in the translation-elicitation task. The results of a correlational analysis indicated that mean similarity rating and mean accuracy in the translation-elicitation task were significantly, positively correlated (NPG condition: $r = +.85$, $p < .001$; PG condition: $r = +.84$, $p < .001$). These findings suggest that if researchers select cognates on the basis of similarity rating or translation accuracy, they are likely to identify the same word candidates, especially when the upper limits of similarity and accuracy are considered. Of our 112 words translated correctly more than 50% of the time, the mean similarity rating was 5.98. Of our 451 words translated correctly less than 50% of the time, the mean similarity rating was 2.28.

[1] The sizes of the two word-frequency corpora differ. The corpus used by Francis and Kucera (1982) contains 1,014,000 words. The CELEX German database contains 6,000,000 words. The lemma frequencies reported in Appendices 2–4 are raw lemma frequency from Francis and Kucera (1982) and adjusted lemma frequency (lemma frequency/6) from the CELEX database.

Table 1. *Mean similarity rating (and standard deviation) for the two conditions of each factor*

	Orthography	
Guide	Without German-specific characters	With German-specific characters
Pronunciation guide (PG)	3.30 (0.43)	2.53 (0.52)
No pronunciation guide (NPG)	3.21 (0.47)	2.28 (0.53)

Table 2. *Mean percentage of correct translations (and standard deviation) for the two conditions of each factor*

	Orthography	
Guide	Without German-specific characters	With German-specific characters
Pronunciation guide (PG)	22.41 (3.64)	7.43 (2.18)
No pronunciation guide (NPG)	21.41 (3.99)	6.36 (2.19)

Our third aim was to determine whether words containing German-specific characters (i.e., umlauted vowels and/or esszets) were responded to differently than other words (the Orthography factor) and whether giving a pronunciation guide (the Guide factor) influenced participants' responses in the similarity rating and the translation elicitation tasks. Table 1 displays mean similarity rating for the two conditions of each factor and Table 2 displays the mean percentage of correct translations for the same two factors. Two analyses of variance (ANOVAs) were conducted in which Orthography was treated as a within-participants factor and Guide was treated as a between-participants factor. Performance in the similarity-rating and translation-elicitation tasks was influenced in part by a main effect of Guide. Participants who received the pronunciation guide gave higher similarity ratings ($M = 2.92$, $SD = 0.48$) than did participants who did not have the pronunciation guide ($M = 2.75$, $SD = 0.50$), but the difference failed to reach statistical significance, $F(1,98) = 3.37$, *N.S.* However, participants who received the pronunciation guide did translate more nouns correctly than did those participants who did not receive the pronunciation guide (14.92% vs. 13.89%, respectively), $F(1,98) = 4.83$, $p < .05$.

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The main effect of Orthography was significant in both tasks. Similarity ratings for translation pairs in which the German word contained a German-specific character (M=2.41, SD= 0.53) were significantly lower than for those in which the German word did not contain a German-specific character (M = 3.26, SD = 0.45), $F(1, 98) = 908.11$, $p < .001$. Words with German-specific characters were correctly guessed less often than words that did not contain these German-specific characters (6.90% vs. 21.91%, respectively), $F(1,98) = 1666.59$, $p < .001$. However, the Orthography effect should be interpreted with caution, as there were many more words without German-specific characters than words with German-specific characters (405 vs. 158, respectively). Furthermore, the difference observed can be due to inherent differences between the two types of words. For example, our German words containing German-specific characters were lower in mean word frequency than words without such characters (German: 39 vs. 96; English: 65 vs. 140), and English words whose German translations contained language-specific characters (M = 4.50, SD = 0.91) were lower in rated imageability than other words (M = 5.10, SD = 0.92), $t(49) = 14.69$, $p < .001$).

Our results also suggest that the instructions differentially influenced participants' task performance for words with German-specific characters and words without German-specific characters in the similarity-rating task, but not in the translation-elicitation task. For similarity ratings, the difference obtained between Guide conditions for translation pairs in which the German word contained German-specific characters was larger than that for translation pairs in which the German word did not contain German-specific characters. This resulted in an interaction of Orthography and Guide, $F(1, 98) = 8.03$, $p < .01$. This suggests that participants receiving the pronunciation guide were able to generate the proper pronunciation of words containing German-specific characters and that they based their rating, in part, on the similarity in the sounds of each word in the translation pair. Participants not receiving the pronunciation guide were apparently unable to figure out the correct pronunciations of the non-English characters. The practical implication of this result is that providing a pronunciation guide for participants may result in higher similarity ratings for translation pairs in which the German word contains German-specific characters, but results in comparable similarity ratings for other translation pairs. Performance in the translation-elicitation task was not significantly influenced by an interaction between Instructions and Orthography, $F < 1$. We believe that differences in the demand characteristics of the two tasks contribute to this difference in the results. The translation-elicitation task is the more difficult task. Participants must guess the translation of a German word that they do not know. Most of the time, participants cannot guess correctly. They are aware that they are incorrect most of the time. Consequently, participants find the task rather frustrating. Providing pronunciation information to participants does not appear to improve their performance on the words containing German-specific characters any more than it improves their performance on other types of words.

Finally, correlational analyses were conducted to explore the relationships between the results of the two tasks (similarity rating and translation elicitation) and imageability ratings as well as word frequency. We found, as did De Groot (1992), very weak correlations between the imageability of words and their cognate status. Similarity ratings of translation pairs were positively, but very weakly associated with imageability ratings (NPG condition: $r = +.10$, $p < .05$; PG condition: $r = +.09$, $p < .05$). As far as translation elicitation is concerned, as imageability increased, accuracy in the task increased very little and only when participants did not receive the pronunciation guide (NPG condition: $r = +.09$, $p < .05$; PG condition: $r = +.07$, *N.S.*). These correlations involving imageability suggest that researchers using our database may want to assess imageability as a factor, or control for it, when conducting studies using cognates and non-cognates, particularly in studies investigating conceptual representations and processes.

The word frequency of the English and the German words in each pair was significantly correlated ($r = +.76$, $p < .001$). Increases in word frequency in English were associated with increases in word frequency in German. This was not a surprising result given that words in one language tend to be used in similar contexts, thus with similar frequency, as their translations in the other language. Broken down by translation category defined by the 50% cutoff in the translation-elicitation task, the correlations between English and German word frequencies between correct translations were +.70 for cognates, +.89 for false cognates and +.73 for non-cognates. Over all translation categories, increases in English word frequency were associated with very weak increases in similarity rating (NPG condition: $r = +.14$, $p < .001$, PG condition: $r = +.15$, $p < .001$) and translation accuracy (NPG condition: $r = +.12$, $p < .01$; PG condition: $r = +.10$, $p < .05$). However, German word frequency was not significantly correlated with similarity rating (NPG condition: $r = +.06$, N.S.; PG condition: $r = +.07$, N.S.) or translation

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accuracy (NPG condition: $r = +.03$, N.S.; PG condition: $r = +.02$, N.S.). As our participants were native speakers of American English, it seems that word frequency in their native language influenced their similarity ratings and their performance in the translation-elicitation task, although the manner in which this variable would exert an influence is unclear and warrants further investigation. Nevertheless, word frequency is a variable that should be considered when selecting stimuli from our database.

General discussion

The research described in this paper investigated 563 German–English translation pairs for the purposes of identifying cognates, false cognates and non-cognates. Two methods for establishing cognate status were compared: (i) the similarity-rating technique, used previously by De Groot and Nas (1991) and (ii) a modified version of the translation-elicitation task, used previously by Kroll and Stewart (1994). Our modification of the translation-elicitation task involved our presenting words in random order rather than presenting noun lists categorized semantically. We explored the relationship between participants' performance in the similarity-rating and translation-elicitation tasks and we investigated the extent to which the results were influenced by item-specific characteristics, such as whether the German word contained German-specific characters, and by the presence of pronunciation information in the instructions. We also examined the correlation between the results and word frequency as well as rated imageability.

We identified 112 translation pairs that serve as good candidates for cognates and 94 non-translation pairs that serve as good candidates for false cognates. In addition, our results indicated that in terms of identifying cognates, the two tasks provided very similar findings. There was a highly significant, positive correlation between similarity ratings and translation accuracy. In light of these results, researchers desiring to identify cognates in future studies may not find it necessary to carry out both kinds of normative studies. Making similarity ratings is a far easier task for participants than is guessing the translation of a foreign word. Furthermore, scoring similarity rating questionnaires is less laborious for experimenters than is the compilation of correct and incorrect responses given by participants in translation elicitation. However, translation elicitation offers the advantage that experimenters can simultaneously assess cognate and false cognate status within a single questionnaire. If the most frequent response for a given word exceeds a particular criterion (e.g. 50%) it could be considered a cognate or a false cognate depending on the correctness of the response. For an experimenter to assess false cognate status with similarity ratings, one would need to guess whether a given non-translation represents the most appropriate false cognate "translation" and to construct a separate questionnaire for the potential false cognate pairs. Thus, if researchers wish to include only cognates and non-cognates in their studies, then collecting similarity ratings might be the preferred method. If they wish to include false cognate pairs, then translation elicitation may be the more appropriate task in judging the cognate, false cognate and non-cognate status of each pair of words.

Our results also indicated that the presence of pronunciation information led to higher similarity ratings and higher translation accuracy (but only the latter was significant). In the present study, participants with no prior learning experience with German were included in each task. It should be noted that the use of these participants to obtain similarity ratings differs from other rating studies, as most (if not all) of these studies used participants with knowledge of both languages. Bilingual participants are certainly less likely to require a pronunciation guide; thus phonological similarity may have a greater influence on similarity ratings given by bilinguals than on those given by participants with no knowledge of one of the languages. However, the use of the latter type of participants guarantees that similarity ratings will be based on form overlap and not on variations in meaning overlap between words in a translation pair. Another result in the present study showed that, in the similarity-rating task, the presence of pronunciation information in the instructions led to higher similarity ratings for word pairs in which the German word contained German-specific characters than for other word pairs. Participants were apparently able to use the pronunciation information to sound out the entire word containing German-specific characters, allowing them to realize that these words sometimes resemble English words phonologically. However, this pattern was not found in the translation-elicitation task. We speculate that the differences in the demand characteristics between tasks account for this difference. The translation-elicitation task is the more challenging task. We also observed, as did De Groot (1992), that a word's status as a cognate was weakly associated with imageability and with English word frequency. Imageability and frequency were positively correlated (although weakly) with similarity rating and translation accuracy, indicating that, at least in our sample, cognates tend to be higher in imageability and more frequently encountered than non-cognates.

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In sum, two methods for identifying cognates were described and they were shown to yield similar results. Our resulting database of German–English cognates, false cognates and non-cognates can be used as a resource for researchers investigating German–English bilinguals. Based on our research, researchers desiring to create new databases of cognates for other language pairs, particularly those pairs that have different orthographic rules, are likely to identify more cognates if pronunciation information is provided to participants.

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Appendix 1 The pronunciation guide used in the study

Vowels		*Consonants*	
a	as "a" in father	**ch**	like "k" but softer
au	as "ow" in how	**chs**	like "x" in six
ä	as "a" in late or "e" in bed	**g**	as "g" in go
		j	as "y" in you
äu	as "oy" in boy	**kn**	both "k" and "n" sounds
eu	as "oy" in boy pronounced	**qu**	both "k" and "v" sounds pronounced
ei	as "i" in fine		
ö	similar to sound in "her" and "first" but made with the lips well rounded	**s**	same as English, unless it begins a word (pronounced like "z" here)
u	as "oo" in good	**sp** or **st**	as "shp" or "sht" when beginning the word
ü	similar to some Scottish pronunciations of "u". Say "i" as in bit with the lips rounded and pushed forward	**sch**	like "sh" in sheep
		ß	as "ss" in press
		th	as "t" in tent
		v	as "f" in feel
		w	as "v" in vase
		z	as "ts" in bits

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Appendix 2 Summary of results for cognates (nouns translated correctly between 50% and 100% of the time in at least one of the two Guide conditions)
E = English; G=German; PG = with pronunciation guide; NPG = without pronunciation guide

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Action	Aktion	359/83	2.60	5.68/5.40	16/12	Apron (2/3)
Address	Adresse	86/30	5.16	6.16/5.88	25/25	—
Apple	Apfel	15/12	6.48	4.60/4.44	15/17	—
Arm	Arm	217/122	6.20	6.80/6.92	25/21	—
Author	Autor	77/60	3.76	6.08/5.44	20/15	—
Baby	Baby	80/13	6.58	6.64/6.96	25/25	—
Bank	Bank	110/90	5.92	6.72/7.00	25/24	—
Beer	Bier	36/46	6.08	6.52/6.00	24/17	Buyer (0/3), Pier (0/3)
Blouse	Bluse	2/6	5.88	5.48/5.28	19/18	Blue (3/4)
Butter	Butter	27/19	5.80	6.40/6.96	24/23	—
Cable	Kabel	6/6	5.40	5.80/5.88	18/16	—
Camera	Kamera	46/24	5.88	6.44/6.56	25/25	—
Carrot	Karotte	5/<1	5.84	6.16/5.80	18/14	Karate (4/7)
Cat	Katze	42/18	6.32	5.00/4.68	20/15	Kite (0/3)
Character	Charakter	154/73	3.36	6.08/5.88	21/22	—
Cigarette	Zigarette	38/51	6.08	6.16/5.84	25/25	—
Coffee	Kaffee	78/53	6.60	5.96/6.08	23/22	—
Cola	Cola	0/0	5.64	6.68/7.00	23/19	Soda (0/5)
Compromise	Kompromiß	18/28	2.56	5.48/4.56	18/12	—
Congress	Kongreß	3/65	3.48	5.88/4.24	19/9	—
Copy	Kopie	54/7	3.12	6.24/5.68	18/19	Cope (0/3)
Crab	Krabbe	2/2	6.16	4.96/4.72	15/18	Crabby (3/2)
Culture	Kultur	71/77	2.96	5.96/5.80	15/11	Cult (0/3), Cutter(0/3)
Curve	Kurve	64/24	5.40	6.40/6.40	24/23	—
Debate	Debatte	36/53	3.71	5.40/5.44	19/15	Bat (4/3), Battle (0/3)
Domain	Domäne	12/2	2.44	5.96/5.60	18/20	House (0/3)
Encyclopedia	Enzyklopädie	3/2	5.28	5.56/5.48	21/17	—
End	Ende	423/374	2.44	5.80/5.64	21/20	—
Energy	Energie	111/52	2.84	6.36/5.96	24/23	—
Factor	Faktor	176/37	2.20	6.36/6.08	21/21	—
Fall	Fall	94/121	4.40	6.68/7.00	22/23	—
Family	Familie	405/119	6.16	6.04/6.16	25/25	—
Feast	Fest	5/24	5.58	5.04/5.08	6/13	—
Field	Feld	333/100	5.36	5.28/4.80	19/18	Felt (0/3)
Finger	Finger	106/60	6.20	6.80/6.96	24/24	—
Fish	Fisch	33/34	6.52	6.20/5.68	22/24	—
Friend	Freund	294/206	6.36	5.44/5.40	11/13	Freud (4/0), Find (0/3), Fraud (0/3)
Garage	Garage	25/28	6.20	6.28/6.92	25/23	—
Garden	Garten	91/53	5.92	5.64/6.00	23/25	—
Girdle	Gürtel	2/7	6.00	5.56/5.08	16/10	Girl (2/4)
Gold	Gold	37/48	6.68	6.88/6.92	23/25	—
Ground	Grund	227/437	5.08	5.40/5.60	17/12	Grind (4/3)
Guitar	Gitarre	22/3	6.64	5.96/5.56	22/23	—
Hair	Haar	160/72	6.32	5.64/5.40	20/20	—
Hand	Hand	717/472	6.72	4.40/4.76	25/25	—
Hotel	Hotel	147/117	5.84	6.72/7.00	24/25	—
House	Haus	662/333	6.60	5.76/5.36	17/14	—
Hut	Hütte	19/68	4.64	5.56/5.76	13/9	Hat (0/4), House (0/4)

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Appendix 2 (*continued*)

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Idea	Idee	337/109	2.48	5.36/5.80	21/16	—
Insect	Insekt	37/6	6.68	5.84/6.16	15/21	—
Jeans	Jeans	1/<1	5.84	6.48/7.00	25/21	Pants (0/3)
Knee	Knie	73/37	6.72	5.84/5.88	21/11	Knife (4/9)
Land	Land	232/844	5.32	6.92/6.96	24/24	—
Line	Linie	491/110	4.60	5.08/5.20	12/13	Linear (3/0), Lining (3/0)
Magazine	Magazin	65/9	6.32	6.12/6.08	25/24	—
Man	Mann	2110/740	5.60	6.36/6.28	23/23	—
Market	Markt	185/103	4.44	5.96/5.88	19/22	Marked (4/0)
Microphone	Mikrophon	8/7	6.48	6.12/5.72	24/20	—
Minute	Minute	242/238	3.00	6.56/6.96	22/25	—
Model	Modell	120/57	6.04	6.40/6.40	24/23	—
Moment	Moment	301/39	2.42	6.80/7.00	24/24	—
Name	Name	365/276	5.08	6.80/6.96	25/24	—
Nation	Nation	354/110	3.60	6.76/7.00	25/24	—
Nature	Natur	198/119	4.84	5.36/6.12	23/23	—
Nose	Nase	65/35	6.00	4.84/4.88	14/17	Nice (4/0)
Notice	Notiz	39/14	2.64	6.00/5.64	14/12	Note (4/3)
Number	Nummer	658/46	5.68	5.76/5.72	22/25	—
Ocean	Ozean	37/13	6.24	5.92/5.88	24/24	—
Paper	Papier	208/75	6.36	5.68/5.88	25/25	—
Party	Party	283/14	5.56	6.68/6.96	25/25	—
Perfume	Parfüm	11/1	5.52	5.72/5.76	25/24	—
Person	Person	299/150	5.40	6.72/7.00	25/24	—
Plan	Plan	278/204	3.08	6.92/7.00	25/24	—
President	Präsident	424/277	6.48	5.60/5.36	25/25	—
Problem	Problem	560/319	2.60	6.64/6.96	25/24	—
Product	Produkt	195/46	3.40	6.60/6.36	25/25	—
Professor	Professor	78/164	5.54	6.92/7.00	20/23	Teacher (5/0)
Public	Publikum	141/49	3.64	4.60/4.20	12/15	Pumpkin (0/7)
Quality	Qualität	159/87	2.48	4.92/5.20	14/14	—
Radio	Radio	126/61	6.00	6.60/6.80	25/24	—
Reality	Realität	94/54	3.48	5.28/5.12	12/15	—
Region	Region	119/16	3.08	6.48/7.00	25/25	—
Restaurant	Restaurant	53/30	5.54	6.92/7.00	25/25	—
Salad	Salat	12/6	5.64	5.88/5.96	16/14	Salt (8/8)
Salt	Salz	52/11	6.52	5.52/5.32	20/11	Salsa (0/6)
Sauce	Soß	24/0	4.64	4.88/2.36	13/0	Cry (0/8)
Scene	Szene	135/41	3.56	5.52/5.72	13/12	Sneeze (7/5)
Secretary	Sekretärin	210/18	4.92	5.36/4.64	12/17	—
Semester	Semester	12/15	2.88	6.52/7.00	24/25	—
Sock	Socke	10/0	6.52	5.60/5.40	25/24	—
Sofa	Sofa	9/7	6.76	6.80/7.00	25/24	—
Son	Sohn	202/137	5.48	5.76/5.04	14/10	Sun (6/9)
Steak	Steak	14/2	5.92	6.40/7.00	25/23	—
Storm	Sturm	31/38	6.16	5.24/5.40	18/19	Stern (3/0)
Student	Student	351/120	6.25	6.72/7.00	25/24	—
Summer	Sommer	151/68	5.40	5.84/5.72	25/24	—
System	System	548/128	2.16	6.56/7.00	25/25	—
Tea	Tee	29/13	6.12	6.44/5.96	14/13	Tee (8/5)
Telephone	Telefon	79/190	6.76	6.12/5.92	24/25	—
Theme	Thema	63/134	2.38	5.64/5.76	17/14	Thelma (2/5)
Tiger	Tiger	9/8	6.64	6.64/6.96	25/24	—

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Title	Titel	94/84	3.64	5.68/5.52	19/14	—
Toaster	Toaster	0/<1	5.88	6.80/7.00	25/23	—
Tomato	Tomate	7/5	6.24	5.64/5.84	23/25	—
Tragedy	Tragödie	56/12	3.52	5.64/5.52	23/15	—
Uncle	Onkel	58/23	5.72	5.72/5.16	17/14	Ankle (3/4)
University	Universität	256/137	5.72	5.84/5.48	22/24	—
Wagon	Wagen	72/143	6.44	5.88/5.88	23/25	—
Wind	Wind	74/62	4.44	6.68/7.00	24/25	—
Wine	Wein	97/38	5.64	6.24/6.12	14/17	Win (3/0)
Winter	Winter	82/48	5.72	6.64/6.80	22/23	—
Wonder	Wunder	34/46	2.50	5.68/5.56	21/19	—

Appendix 3 Summary of results for false cognates (nouns incorrectly translated with the same incorrect word between 50% and 100% of the time in at least one of the two Guide conditions)
E = English; G=German; PG = with pronunciation guide; NPG = without pronunciation guide

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Autumn	Herbst	22/52	5.50	1.48/1.44	0/0	Herb (19/18)
Bag	Tasche	51/36	6.36	1.52/1.56	0/0	Task (15/10)
Barrel	Faß	32/13	6.32	1.28/1.40	0/0	Fabulous (14/5)
Bath	Bad	31/154	6.42	3.68/2.48	0/0	Bad (20/22)
Bear	Bär	24/8	5.64	5.52/4.24	2/1	Bar (22/24)
Bed	Bett	139/118	6.68	4.76/4.48	2/2	Bet (21/17)
Belief	Glaube	87/44	2.72	1.48/1.28	0/0	Globe (13/7)
Bell	Glocke	23/0	5.52	1.76/1.68	0/0	Clock (15/19)
Boat	Boot	123/26	6.75	4.24/3.72	0/0	Boot (21/23)
Border	Grenze	30/189	4.71	1.36/1.36	0/0	Green (14/16)
Bottle	Flasche	90/36	6.36	2.44/2.56	0/0	Flash (17/17)
Bowl	Napf	26/0	5.40	1.16/1.28	0/0	Nap (19/16)
Boy	Junge	409/65	6.48	1.52/1.36	0/0	Jungle (17/17)
Cake	Kuchen	16/11	5.84	2.16/2.48	0/0	Kitchen (15/15)
Card	Karte	61/47	5.92	4.68/3.60	0/2	Cart (21/18)
Chair	Stuhl	89/38	5.76	2.68/3.04	0/0	Stool (13/10)
Cheese	Käse	9/7	6.56	3.20/2.96	0/0	Case (20/17)
Chief	Chef	62/56	4.56	5.36/5.68	2/2	Chef (21/20)
Child	Kind	620/417	6.24	2.32/2.12	0/0	Kind (23/19)
Choice	Wahl	121/163	2.60	1.24/1.32	0/0	Wall (23/20)
Citizen	Bürger	120/117	4.48	1.48/1.12	0/0	Burger (21/22)
Clerk	Beamte	45/75	4.88	1.56/1.48	0/0	Beam (20/16)
Coat	Mantel	52/26	6.04	1.48/2.00	0/0	Mantel (25/20)
Crate	Kiste	4/22	4.75	2.40/2.58	0/0	Kiss (19/16)
Cream	Rahm	19/1	4.96	2.00/1.88	0/0	Ram (15/12)
Cross	Kreuz	29/39	6.28	3.56/3.84	1/0	Cruise (11/14)
Day	Tag	1077/862	4.28	2.08/1.80	0/0	Tag (24/24)
Desert	Wüste	21/2	6.25	1.64/1.24	0/0	Waste (12/16)
Economy	Wirtschaft	85/175	2.68	1.40/1.04	0/0	Witchcraft (16/13)
Egg	Ei	47/18	6.56	2.80/2.80	0/0	I (17/8)
Factory	Fabrik	56/34	6.00	2.36/2.52	0/0	Fabric (22/22)
Father	Vater	240/234	6.21	5.20/4.16	0/0	Water (18/17)
Flower	Blume	78/32	6.60	2.28/2.52	1/3	Bloom (18/17)
Flute	Flöte	1/5	6.60	4.64/4.64	10/4	Float (12/17)
Foot	Fuß	361/99	6.56	3.00/2.68	0/1	Fun (17/6)
Fun	Spaß	44/31	4.04	1.48/1.60	0/0	Spa (10/13)
Furniture	Möbel	39/22	6.32	1.32/1.40	0/0	Mobile (16/18)

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Appendix 3 (*continued*)

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Grape	Traube	10/3	6.04	1.60/1.48	0/0	Trouble (13/11)
Grave	Grab	20/44	5.96	3.44/2.80	0/0	Grab (20/21)
Hallway	Gang	8/77	5.32	1.12/1.28	0/0	Gang (22/21)
Handle	Bügel	22/4	5.80	1.80/2.04	0/0	Bagel (13/12)
Hat	Hut	71/14	6.20	4.36/4.88	0/0	Hut (16/16)
Hole	Loch	95/9	5.60	1.72/1.80	0/0	Lock (19/16)
Jacket	Jacke	39/0	6.40	5.12/4.76	8/4	Jack (10/13)
Lake	See	61/35	6.04	2.04/2.52	0/0	See (20/22)
Lawn	Rasen	20/9	5.52	1.44/1.52	0/0	Raisin (21/20)
Letter	Brief	260/141	5.28	1.52/2.52	0/0	Brief (18/22)
Library	Bibliothek	90/14	6.52	2.08/2.88	9/9	Bible (8/14)
Lion	Löwe	26/42	6.56	3.40/3.36	0/0	Low (12/14)
Meadow	Wiese	23/21	5.32	1.24/1.00	0/0	Wise (19/16)
Money	Geld	275/201	6.44	1.96/1.72	0/0	Gold (13/15)
Mushroom	Pilz	4/5	5.96	1.20/1.12	0/0	Pills (16/9)
Noise	Lärm	43/20	3.68	1.64/1.84	0/0	Alarm (19/16)
Novel	Roman	71/58	5.80	1.56/1.40	0/0	Roman (24/16)
Nun	Nonne	6/13	5.56	5.44/5.24	2/1	None (15/18)
Pants	Hose	0/23	6.04	1.84/2.36	0/0	Hose (24/24)
Pavement	Pflaster	13/7	5.71	1.92/2.04	0/0	Plaster (13/10)
Pear	Birne	8/4	6.56	1.32/1.48	0/0	Burn (10/13)
Picture	Bild	227/295	4.96	1.20/1.20	0/0	Build (16/20)
Piece	Stück	219/141	3.20	1.56/1.28	0/0	Stuck (17/21)
Place	Platz	584/258	3.28	5.16/4.60	1/2	Plate (17/17)
Plate	Teller	44/11	6.33	1.20/1.16	0/0	Teller (21/19)
Point	Punkt	493/266	3.80	2.76/3.24	2/0	Punk (8/13)
Pot	Topf	33/10	5.00	1.96/2.52	0/0	Top (20/21)
Pumpkin	Kürbis	2/1	6.04	1.24/1.28	0/0	Curb (16/15)
Raft	Floß	5/7	6.52	1.24/1.28	0/0	Floss/Flop (18/9)
Recipe	Rezept	9/13	4.16	5.00/4.76	1/2	Receipt (15/14)
Rent	Miete	1/13	3.16	1.92/2.12	0/0	Meat (13/6)
Rip	Riß	1/8	4.12	3.20/4.88	0/0	Rib (7/18), Wrist (0/7)
Smoke	Rauch	33/13	6.36	1.20/1.08	0/0	Ranch (10/13)
Soup	Suppe	16/9	5.48	6.04/5.00	8/11	Supper (14/11)
Speech	Rede	82/173	3.36	1.68/1.56	0/0	Red (15/11)
Stairs	Treppe	0/28	5.60	2.12/2.12	1/0	Trip (14/13)
Stamp	Briefmarke	7/7	5.96	1.84/1.72	0/0	Briefcase (13/7)
Star	Stern	58/70	6.28	3.36/3.48	0/0	Stern (14/17)
Steam	Dampf	17/6	4.68	1.64/1.52	0/0	Damp (20/20)
Strawberry	Erdbeere	2/2	6.72	2.24/2.08	0/0	Beer (13/12)
Stream	Strom	61/54	6.12	4.80/4.32	0/2	Storm (17/15)
Strength	Kraft	141/347	3.64	1.76/1.68	0/0	Craft (16/19)
Style	Stil	117/47	3.28	4.84/4.24	0/1	Still (20/22)
Sugar	Zucker	34/0	6.04	3.92/2.68	0/0	Sucker (18/15)
Sweater	Pulli	18/1	5.83	1.80/1.80	0/0	Pull (13/13)
Tear	Träne	36/32	6.36	2.20/1.72	0/0	Train (23/24)
Thing	Ding	702/238	2.52	4.16/3.80	1/0	Ding (15/10)
Tone	Ton	97/6	2.48	5.36/5.04	2/2	Ton (20/16)
Track	Gleis	48/8	4.83	1.40/1.32	0/0	Glass (13/11)
Trash	Müll	2/3	6.00	1.72/1.24	0/0	Mall (15/8)
Tree	Baum	160/64	5.72	1.64/1.44	0/0	Bomb (13/7)
Typewriter	Schreibmaschine	11/10	6.28	1.64/1.76	3/0	Machine (9/15)
Valley	Tal	79/24	5.36	1.40/1.44	0/0	Tall (9/15)

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Wall	Wand	224/49	6.16	2.68/2.32	0/0	Wand (16/18)
Weight	Schwere	101/6	4.20	1.60/1.40	0/0	Swear (7/13)
Word	Wort	549/190	3.96	5.04/5.28	0/1	Wart (13/10)
Year	Jahr	1661/2145	3.56	4.84/3.60	0/0	Jar (25/23)

Appendix 4 Summary of results for non cognates

E = English; G=German; PG = with pronunciation guide; NPG = without pronunciation guide

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Ability	Fähigkeit	87/37	2.80	1.40/1.24	0/0	Fahrenheit (3/3)
Abuse	Mißbrauch	22/13	3.60	1.24/1.12	0/0	Branch (3/5), Brunch (1/5)
Achievement	Großtat	84/27	3.24	1.48/1.12	0/0	Gross (10/6), Grow (10/6)
Admission	Einlaß	36/2	3.08	1.40/1.04	0/0	At last (3/0), Laboratory (0/12)
Advertising	Werbung	14/23	3.12	1.56/1.36	0/0	—
Aim	Ziel	40/257	2.56	1.52/1.48	0/0	Zeal (8/9)
Air	Luft	260/108	3.60	1.36/1.36	0/0	Left (6/0), Loft (6/8), Lift (0/8)
Airplane	Flugzeug	21/74	6.20	1.36/1.52	1/0	Flag (7/0), Flute (0/3)
Airport	Flughafen	23/31	5.92	1.20/1.12	0/0	Flag (3/8)
Anger	Zorn	48/22	4.04	1.28/1.44	0/0	Torn (11/8), Horn (11/8)
Animal	Tier	129/127	6.44	1.12/1.36	0/0	Tire (7/7), Tier (0/7)
Answer	Antwort	145/161	3.12	2.88/3.12	0/0	Ant (9/12)
Apartment	Wohnung	98/151	5.54	1.48/1.28	0/0	Woman (6/5)
Appliance	Gerät	13/56	4.80	1.44/1.24	0/0	Great (4/6)
Approach	Annäherung	125/19	2.52	2.08/1.76	0/0	—
Arrow	Pfiel	20/0	5.64	1.40/1.28	0/0	File (9/5)
Article	Artikel	99/88	4.28	6.00/5.80	12/6	Art (4/5)
Artist	Künstler	125/85	5.52	1.56/1.28	0/0	Hustler (4/6)
Aunt	Tante	27/33	5.84	3.80/2.92	1/0	Taunt (8/7)
Back	Rücken	190/0	5.00	1.52/1.36	0/0	Reckon (6/3), Wreck (0/3)
Bakery	Bäckerei	2/0	5.12	5.76/5.12	5/1	Back (6/12)
Basement	Untergeschoß	33/2	6.20	1.48/1.48	0/0	Undergraduate (4/0), School (0/3), Underground (0/3)
Basket	Korb	19/22	6.36	1.24/1.08	0/0	Corn (5/0), Curb (0/5)
Bicycle	Fahrrad	7/18	6.40	1.40/1.56	0/0	Far (3/5)
Blood	Blut	122/43	6.36	4.44/3.28	4/2	Blunt (9/7), Blue (9/7), Blunt (9/7)
Body	Körper	342/72	5.92	1.40/1.76	0/0	Copper (4/3), Corporal (0/3), Corporation (0/3)
Book	Buch	292/182	5.52	5.00/5.12	6/1	Bush (6/12)
Boot	Stiefel	30/12	6.36	1.36/1.20	0/0	Steeple (4/0), Stiff (0/7), Stifle (0/7)
Bouquet	Strauß	5/17	5.72	1.24/1.44	0/0	Straw (5/0), Strobe (0/5)
Box	Lade	82/15	5.20	1.44/1.17	0/0	Laid (7/0), Lady (0/6)
Bread	Brot	41/29	5.88	3.76/2.64	0/0	Brought (7/7)
Breakfast	Frühstück	55/25	6.20	1.72/1.28	0/0	Stuck (3/0), Fruit (0/5)
Breath	Hauch	54/7	3.56	1.24/1.52	0/0	Hunch (7/6)
Brew	Bräu	2/1	4.04	4.64/4.44	0/1	Bra (7/12)
Bridge	Brücke	117/0	6.48	2.64/2.48	0/0	Brick (4/7)
Brother	Bruder	135/88	6.04	5.12/4.68	7/6	—
Building	Gebäude	187/57	5.60	1.16/1.12	0/0	—
Butcher	Metzger	7/4	4.96	2.04/1.44	0/0	Messenger (8/6)
Butterfly	Schmetterling	3/3	6.38	1.56/1.44	0/0	Meter (3/0)
Buyer	Käufer	10/25	3.36	2.40/1.96	0/0	Coffee (3/0), Cough (0/5)
Calf	Kalb	17/7	5.04	3.52/3.92	1/0	Bulb (4/4), Cab (0/4)

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Appendix 4 (*continued*)

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Candy	Süßwaren	18/0	6.67	1.44/1.08	0/0	Subway (0/5)
Carelessness	Nachlässigkeit	2/1	2.64	1.52//1.36	0/0	Kite (3/4)
Castle	Schloß	12/71	6.33	1.40/1.12	0/0	Slob (6/10)
Center	Zentrum	261/51	4.04	2.28/2.12	0/0	Centrum (6/0), Tantrum (0/5)
Certainty	Gewißheit	21/17	1.96	1.52/1.28	0/0	Jewish (3/0), Fahrenheit (0/3)
Chalk	Kreide	2/2	6.36	1.52/1.36	0/0	Creed (7/8)
Cherry	Kirsche	6/0	6.00	1.92/1.84	0/0	Curse (6/3)
Chess	Schach	3/10	5.13	2.24/2.12	0/0	Sack (4/4), Scratch (0/4)
Chest	Brust	57/43	6.24	2.12/1.76	0/0	Brush (4/8), Burst (4/0)
Chocolate	Schokolade	9/8	6.44	4.32/4.16	7/6	School (6/0), Lemonade (0/3)
Church	Kirche	451/211	6.60	4.76/3.88	0/2	Curse (4/4)
Cinema	Kino	3/25	5.08	2.56/1.92	0/0	Kind (7/4)
City	Stadt	521/408	6.04	1.28/1.40	0/0	Stand (9/8)
Climate	Klima	27/27	3.24	4.76/4.36	9/7	Climb (6/8)
Coast	Küste	67/37	4.88	4.16/4.12	0/0	Crust (6/0), Cute (0/4)
Coin	Münze	18/18	5.96	1.36/1.68	0/0	Month (4/0), Maze (0/4)
Cold	Erkältung	24/4	4.36	1.68/1.28	0/0	Tongue (3/6)
Color	Farbe	184/68	5.84	1.28/1.24	0/0	Far (8/10)
Column	Säule	107/12	5.60	1.36/1.40	0/0	Soil (6/0), Salt (0/3), Salute (0/3), Soul (0/3)
Community	Gemeinschaft	275/100	3.40	1.28/1.20	0/0	German (3/3), Gem (0/3)
Compartment	Abteil	12/4	3.24	1.12/1.12	0/0	Tail (5/4)
Completion	Abschluß	64/97	2.76	2.00/1.20	0/0	Absolute (8/4)
Conclusion	Schluß	95/97	2.72	1.52/1.32	0/0	School (5/4)
Connection	Anschluß	86/36	2.32	1.48/1.24	0/0	Answer (3/6), Ant (3/0)
Consciousness	Bewußtsein	30/76	2.83	1.52/1.16	0/0	—
Container	Gefäß	14/5	5.72	1.32/1.20	0/0	—
Conversation	Gespräch	60/294	3.28	1.52/1.50	0/0	Despair (0/3)
Cookie	Plätzchen	10/0	6.32	1.24/1.20	0/0	Plate (7/9)
Corner	Ecke	134/0	5.28	1.32/1.16	0/0	Neck (0/3)
Court	Gericht	286/107	5.17	1.48/1.64	0/0	Rich (0/4)
Cow	Kuh	46/40	6.12	4.48/3.84	0/0	Cup (3/0), What (0/3)
Crib	Krippe	8/2	6.38	5.12/4.76	1/5	Cripple (6/5)
Cucumber	Gurke	0/3	5.92	1.56/1.88	0/0	Jerk (8/4)
Cup	Tasse	58/10	5.80	1.64/1.28	0/0	Tassel (9/12)
Danger	Gefahr	86/178	4.32	1.68/1.44	0/0	Gopher (5/0), Grandfather (5/0), Far (0/3), Giraffe (0/3)
Daughter	Tochter	91/96	4.84	3.32/2.64	0/0	Touch (5/5)
Death	Tod	284/170	4.40	1.52/1.08	0/0	Toad (6/9), Todd (6/0)
Decision	Entscheidung	173/201	2.36	1.52/1.38	0/0	—
Dentist	Zahnarzt	19/4	6.08	1.64/1.32	0/0	Heart (6/2)
Desk	Schreibtisch	69/21	6.36	1.2/1.2	0/0	—
Destruction	Zerstörung	38/25	4.44	1.92/1.84	0/0	Store (3/0), Strung (3/0), Strong (0/6)
Devil	Teufel	32/22	6.40	2.48/1.76	0/0	Touch (0/4)
Discount	Ermäßigung	13/4	3.32	1.40/1.20	0/0	—
Dishes	Geschirr	0/8	5.80	1.64/1.56	0/0	Gesture (6/5)
Dishwasher	Spüler	1/0	6.40	1.48/1.42	0/0	Spider (5/0), Spoiler (5/0), Spill (0/6)
District	Bezirk	176/108	2.38	1.52/1.36	0/0	Berzerk (10/12)
District	Gebiet	176/298	3.08	1.20/1.08	0/0	Gerbil (0/3)
Dog	Hund	147/61	6.40	2.56/3.84	1/1	Hound (9), Hunt (6)

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Door	Tür	348/123	5.64	2.64/2.36	0/0	Tore (4/0), Turf (4/0), Tour (0/8)
Doubt	Zweifel	115/73	2.84	1.32/1.24	0/0	Knife (3/0), Waffle (3/0), Wife (3/3)
Drawer	Schublade	13/6	6.42	1.40/1.36	0/0	Blade (4/8)
Dream	Traum	88/38	5.00	3.04/2.08	0/0	Trauma (9/12)
Dress	Kleid	63/41	5.56	1.64/1.52	0/0	Climb (4/0), Collide (0/4)
Drink	Getränk	75/13	5.80	2.24/1.88	0/0	Tank (8/9)
Dune	Düne	9/3	4.20	5.92/6.24	7/8	Done (7/12)
Ear	Ohr	67/49	6.12	4.36/4.04	1/0	Oar (7/7)
Enjoyment	Genuß	21/19	3.80	1.24/1.08	0/0	Genius (11/6)
Era	Ära	34/0	2.25	5.76/5.16	9/7	Air (5/0), Aura (0/4)
Error	Fehler	80/57	3.17	2.00/1.68	0/0	Fellow (4/0)
Exchange	Austausch	72/23	2.92	2.00/2.16	0/0	August (4/0)
Exercise	Übung	54/17	4.92	1.68/1.28	0/0	Bug (4/5)
Experience	Erfahrung	306/195	2.52	2.08/2.04	0/0	Rug (4/5)
Experience	Erlebnis	306/29	3.16	2.04/2.12	0/0	Early (5/5)
Explanation	Erläuterung	58/11	2.32	1.96/2.40	0/0	Ear (3/0)
Expression	Äußerung	94/53	3.12	1.84/1.32	0/0	Autumn (6/6)
Eye	Auge	524/302	6.58	2.80/1.76	0/0	Age (11/11)
Face	Gesicht	379/102	6.36	1.32/1.28	0/0	Guess (5/4)
Failure	Mißlingen	93/0	3.21	1.44/1.40	0/0	Mislead (5/0)
Fastener	Verschluß	0/1	4.40	1.48/1.28	0/0	—
Fatigue	Ermüdung	13/2	4.00	1.28/1.24	0/0	Arm (0/3), Mud (0/3)
Fear	Angst	141/101	3.48	1.72/2.00	0/0	August (6/6)
Fee	Gebühr	45/14	3.76	1.36/1.24	0/0	Girl (3/0)
Feeling	Gefühl	192/97	3.24	1.72/1.40	0/0	Fuel (0/4)
Fence	Zaun	46/14	5.64	1.64/1.40	0/0	Sun (5/3), Gone (0/3)
Fight	Streit	58/43	5.24	2.60/2.00	0/0	Straight (12/12)
Fire	Feuer	195/54	6.28	4.92/4.40	1/2	Fewer (6/12)
Flag	Fahne	18/27	6.36	2.16/2.08	0/0	Fan (5/12)
Flesh	Fleisch	52/35	5.60	5.56/5.16	8/10	Fish (6/0), Flinch (0/4)
Floor	Boden	170/152	5.96	1.24/1.20	0/0	Boredom (3/0), Body (0/5)
Foreigner	Ausländer	17/25	4.16	2.12/2.21	1/0	Islander (4/0), Land (0/4)
Forest	Wald	88/80	5.92	1.60/1.32	0/0	Bald (6/0), Wall (6/7)
Forgery	Fälschung	2/2	2.88	2.04/3.00	0/0	False (5/5)
Fork	Gabel	20/4	5.56	1.16/1.44	0/0	Gable (4/3), Stable (0/3)
Foundation	Gründung	65/47	3.48	1.48/1.44	0/0	Ground (5/5)
Frame	Rahmen	96/117	5.04	1.96/1.88	0/0	Ramen (7/0), Noodles (0/6)
Frog	Frosch	2/4	6.44	3.00/2.60	1/0	Frost (10/10)
Fruit	Obst	49/11	5.52	1.24/1.40	0/0	Obstacle (6/7)
Fund	Fonds	160/6	2.76	4.92/4.32	10/2	Ponds (4/6)
Funeral	Begräbnis	31/7	6.04	1.36/1.32	0/0	Beggar (3/0), Grab (0/4)
Future	Zukunft	108/193	3.76	1.40/1.20	0/0	Zoo (3/0)
Gesture	Geste	38/16	4.20	4.84/4.68	5/2	Guest (12/6)
Gift	Geschenk	45/30	5.40	2.24/2.28	0/0	Check (4/4), Guess (0/4)
Girl	Mädchen	374/226	6.44	1.80/1.32	0/0	Mad (5/4)
Government	Regierung	495/516	4.08	1.28/1.24	0/0	Ring (4/3), Register (4/0)
Grandmother	Großmutter	14/43	6.08	4.48/4.32	4/3	Grocery (3/0), Gross (3/0), Butter (0/3)
Greeting	Gruß	10/35	3.54	2.24/2.24	0/0	Gross (11/11), Food (11/11)
Grit	Grieß	4/<1	2.92	2.80/2.52	0/0	Grease (8/0), Grief (0/9)
Guarantee	Gewähr	12/20	2.44	3.04/2.32	0/0	War (4/8)
Guest	Gast	99/149	4.29	4.80/4.32	2/0	Gas (11/7)
Hall	Saal	151/41	5.48	3.68/2.72	0/0	Sale (7/0), Sail (0/5)
Ham	Schinken	16/3	5.88	1.24/1.28	0/0	Shrink (3/0), Sink (0/3), Sunken (0/3)
Hare	Hase	1/12	4.40	2.48/3.12	0/0	House (6/5)
Hate	Haß	10/21	3.29	2.88/2.88	0/1	Has (8/0), Hat (0/7)
Head	Kopf	449/230	6.32	1.24/1.20	0/0	Cop (9/7)

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Appendix 4 (*continued*)

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Heart	Herz	199/150	6.56	4.48/4.00	0/1	Hers (9), Hurt (5)
Heat	Heizung	93/10	4.24	2.40/2.16	0/0	Height (4/0), Hazing (0/3)
Height	Höhe	58/165	4.56	3.08/1.92	0/0	Hoe (6/5)
Help	Hilfe	99/215	3.00	3.04/3.46	0/1	Hill (12/11)
Hill	Hügel	119/17	6.08	2.88/2.84	0/0	Huge (9/11)
Honesty	Ehrlichkeit	10/3	3.60	1.24/1.40	0/0	Kite (4/0), Lick (0/3)
Hook	Haken	5/10	6.46	2.8/2.48	0/0	Taken (3/0), Shaken (0/4)
Horse	Pferd	203/65	6.72	1.32/1.24	0/0	Preferred (8/8)
Hour	Stunde	325/316	3.88	1.28/1.32	0/0	Stand (6/4), Stunned (6/4), Stunt (0/4)
Hunter	Jäger	17/15	6.32	1.84/1.44	0/0	Jaguar (6/10)
Impact	Anstoß	70/11	2.76	1.64/1.48	0/0	Answer (5/0), Ant (0/6)
Instruction	Belehrung	61/4	2.92	1.20/1.12	0/0	Bell (5/8)
Introduction	Einführung	40/41	2.48	1.48/1.20	0/0	—
Iron	Eisen	46/21	5.36	2.80/2.24	0/0	Eye (4/0), Eyes (0/3)
Island	Insel	207/70	5.52	3.60/4.00	1/0	Insult (3/0), Inside (0/4), Tinsel (0/4)
Jail	Gefängnis	24/53	6.32	1.44/1.16	0/0	Fungus (4/6)
Joke	Witz	27/16	3.44	1.68/1.96	0/0	Wits (7/7)
Journal	Zeitschrift	47/49	5.52	1.36/1.24	0/0	Drift (0/3)
Judge	Richter	81/55	6.32	1.48/1.56	0/0	Richer (5/0), Richter (5/0), Rich (0/6)
Juice	Saft	13/5	5.50	1.24/1.28	0/0	Safe (6/0), Soft (0/5)
Jungle	Dschungel	24/0	6.08	2.64/2.56	3/4	Shingle (0/3)
Junk	Rummel	8/5	5.24	1.44/1.80	0/0	Rumble (6/0), Rummage (0/5)
Key	Schlüssel	71/24	5.76	1.28/1.16	0/0	—
King	König	98/108	5.84	3.84/3.92	1/1	—
Kiss	Kuß	11/12	6.08	4.80/2.56	3/0	Cuss (11/7), Cub (11/7)
Kitchen	Küche	95/69	6.38	4.04/4.04	0/0	Cash (3/0), Cook (3/0), Couch (0/3), Catch (0/3)
Knife	Messer	86/8	5.92	1.40/1.24	0/0	Messenger (12/7)
Knowledge	Wissen	145/83	3.24	1.84/2.48	0/0	Wise (6/11)
Knuckle	Knöchel	9/4	4.76	5.48/4.88	3/1	Knock (9/11)
Law	Gesetz	387/175	2.84	1.36/1.36	0/0	Guess (4/2)
Lawyer	Rechtanwalt	69/0	5.80	1.44/1.38	0/0	—
Leader	Leiter	187/58	4.88	4.88/4.72	0/0	Liter (7/0), Letter (0/7)
Leg	Bein	126/73	5.96	1.28/1.32	0/0	Good (8/0), Been (0/9)
Length	Länge	139/33	3.76	3.40/3.76	0/0	Language (9/9), Lounge (0/9)
Lie	Lüge	9/32	2.64	3.04/2.44	0/0	Luge (7/4), Large (0/4)
Life	Leben	772/589	3.96	2.84/2.68	0/0	Leaving (3/0)
Light	Licht	306/104	5.79	4.96/5.08	7/10	Lick (6/8)
Loss	Verlust	132/62	3.12	1.76/1.60	0/0	Lust (5/6)
Luck	Glück	48/95	3.67	4.00/3.36	3/9	Lick (3/0), Clock (0/5)
Luggage	Gepäck	10/11	6.08	1.76/1.48	0/0	Backpack (8/9)
Marriage	Ehe	122/73	5.12	1.32/1.08	0/0	He (3/2)
Meal	Essen	56/93	5.00	1.56/1.36	0/0	Essence (6/9)
Meaning	Bedeutung	138/181	2.00	1.52/1.28	0/0	Bed (7/10)
Measurement	Ausmaß	88/33	4.20	1.36/1.08	0/0	August (3/0)
Member	Mitglied	464/291	3.58	1.84/1.84	0/0	Mitt (4/0), Mingled (0/3), Mitten (0/3)
Memory	Erinnerung	91/59	2.80	1.52/1.28	0/0	Engineer (4/0), Errand (0/4)

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Menu	Speisekarte	7/4	6.24	1.20/1.24	0/0	Cart (6/2)
Milk	Milch	49/43	5.80	5.44/4.96	12/8	Mulch (6/6)
Mirror	Spiegel	27/38	6.48	1.28/1.24	0/0	Spiegel (6/0), Clothes (0/4), Magazine (0/4)
Misery	Elend	17/17	3.60	1.44/1.28	0/0	Lend (6/9)
Mistake	Mißgriff	45/1	2.96	2.84/2.48	0/0	Mischief (4/0)
Mistrust	Mißtrauen	4/21	2.92	4.00/2.92	0/0	Mistress (4/0), Train (0/4)
Mis-understanding	Mißverständnis	7/17	2.24	4.44/4.12	10/4	Misunderstand (6/0), Understand (0/3)
Monk	Mönch	23/25	4.92	5.80/5.00	8/6	Month (4/0), Munch (0/5)
Monster	Ungetüm	9/2	5.16	1.64/1.20	0/0	Under (5/0)
Month	Monat	327/327	3.72	3.80/3.32	1/1	Minute (5/0), Money (0/9)
Monument	Denkmal	29/13	5.40	1.60/1.24	0/0	Denmark (7/4)
Moon	Mond	63/77	6.60	3.32/3.32	0/0	Pond (4/6), Monday (4/0), Mound (4/0)
Mountain	Berg	98/67	6.24	1.72/1.92	1/1	Ice (3/0), Berg (0/6)
Mouse	Maus	20/10	6.52	5.36/5.08	9/11	Mars (3/0)
Mouth	Mund	113/65	5.92	3.00/2.80	0/0	Mud (5/9)
Mower	Mäher	0/0	6.56	4.80/4.88	0/0	Mother (7/0)
Mustard	Senf	19/4	5.00	1.28/1.16	0/0	Sense (5/0), Sent (0/3)
Napkin	Serviette	5/1	6.20	2.12/2.44	0/0	Servant (7/7)
Necktie	Krawatte	2/5	6.38	1.56/1.52	1/0	Karate (9/5)
Need	Bedürfnis	253/42	2.08	1.48/1.12	0/0	Bed (6/7)
Neighbor	Nachbar	59/44	4.92	4.04/3.56	0/0	Snackbar (7/5), Candybar (0/5)
Nephew	Neffe	14/7	5.60	4.28/4.20	5/2	Enough (7/0), Neck (0/4)
Newspaper	Zeitung	104/177	5.76	1.32/1.08	0/0	—
Night	Nacht	457/159	6.08	4.96/4.64	9/9	Nacho (4/0), Not (0/3)
Notebook	Heft	4/23	5.64	1.48/1.16	0/0	Heavy (6/0), Hefty (0/5), Left (0/5)
Nut	Nuß	35/4	6.40	3.56/3.56	0/0	New (3/6)
Observation	Beobachtung	67/31	2.42	1.60/1.32	0/0	—
Occasion	Anlaß	80/79	2.68	1.24/1.24	0/0	Lab (4/9)
Office	Büro	301/69	5.28	2.52/2.52	0/0	Burrow (5/0), Borrow (0/5)
Onion	Zwiebel	19/13	6.36	1.44/1.24	0/0	Swivel (3/0), Table (3/0)
Opponent	Gegner	30/93	3.96	1.24/1.32	0/0	Ginger (4/0), Gag (0/4)
Opposite	Gegenteil	7/50	2.80	1.36/1.48	0/0	Gentle (8/8)
Order	Ordnung	416/124	2.60	3.20/3.64	4/4	Ordinary (10/9)
Origin	Ursprung	51/34	1.92	1.28/1.48	0/0	Offspring (4/9)
Outline	Umriß	13/0	4.08	1.44/1.32	0/0	Umbrella (6/7)
Outside	Außenseite	22/1	5.52	2.36/1.76	0/0	Absent (3/4), Awesome (3/0)
Pain	Schmerz	102/36	4.04	1.16/1.20	0/0	Smirk (4/4)
Passport	Reisepaß	6/3	6.08	1.64/1.60	0/0	Pass (3/0), Recipe (3/0), Rice (0/6)
Past	Vergangenheit	100/90	2.48	1.64/1.24	0/0	Fahrenheit (4/6)
Pastor	Pfarrer	26/30	5.88	3.24/3.44	0/0	Far (6/8)
Peach	Pfirsich	4/0	6.56	3.08/2.48	0/0	Fish (5/5)
Pen	Kugelschreiber	18/3	5.56	1.24/1.20	0/0	Subscriber (4/4), Describe (0/4), Describer (0/4)
Pencil	Bleistift	38/5	6.54	1.24/1.00	0/0	Blister (3/0)
People	Leute	902/182	5.79	1.56/1.32	0/0	Loot (8/6)
Pepper	Pfeffer	13/3	5.48	3.92/4.08	0/2	Prefer (8/7)
Pharmacy	Apotheke	5/12	5.00	2.00/2.04	0/0	Apathetic (3/4), Apothem (0/4)
Piano	Klavier	39/15	6.52	1.44/1.28	1/0	Clever (4/4)
Pig	Schwein	14/25	5.96	3.32/3.92	2/2	Bicycle (5/4)
Pipe	Pfeife	27/11	5.60	3.80/3.20	7/5	Knife (5/4)
Plain	Ebene	21/57	2.96	1.60/1.28	0/0	Ebony (10/6)
Police	Polizei	155/176	6.52	5.44/5.56	10/9	Politics (4/0), Polish (0/4)
Possibility	Möglichkeit	130/346	2.20	1.88/1.08	0/0	Kite (3/0), Market (3/0), Mogul (0/4)

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Appendix 4 (*continued*)

Correct English translation	German noun	Lemma frequency per million E/G	Imageability rating	Similarity rating PG/NPG	No. correct translations PG/NPG	Incorrect translations PG/NPG
Poster	Plakat	8/18	5.92	2.28/2.12	0/0	Plate (7/0), Blanket (0/5), Plank (0/5), Plaque (0/5)
Potato	Kartoffel	30/25	5.79	1.32/1.12	0/0	Cart (11/8)
Pressure	Druck	222/50	2.64	1.36/1.20	0/0	Drunk (11/7), Truck (11/7)
Pretzel	Brezel	0/<1	5.88	5.28/5.32	12/7	Brazil (5/8)
Price	Preis	164/264	4.24	5.60/5.12	6/5	Prize (5/0),Priest (0/7)
Principle	Prinzip	179/98	3.52	5.04/4.80	11/7	Principal (4/5)
Process	Prozeß	252/106	1.96	5.72/4.08	9/0	Prozac (5/4)
Profession	Beruf	42/87	3.64	1.20/1.32	0/0	Roof (3/6)
Puddle	Pfütze	3/22	6.32	2.16/2.12	0/0	Foot (5/7)
Pupil	Schüler	45/105	5.60	1.72/1.56	0/0	School (6/5), Shoe (0/5)
Question	Frage	378/892	3.56	1.32/1.56	0/0	Fog (4/0), Refrigerator (0/5)
Railroad	Bahn	77/68	6.36	1.44/1.48	0/0	Barn (5/7)
Rain	Regen	73/48	6.50	3.04/2.84	0/1	Region (6/7)
Reduction	Kürzung	46/12	2.17	1.72/1.16	0/0	—
Refrigerator	Kühlschrank	25/6	5.88	1.32/1.44	0/0	Crank (3/0), Shrank (0/4)
Reliance	Verlaß	7/3	2.60	1.40/1.32	0/0	Burlap (3/0), Verb (0/8)
Report	Bericht	205/191	4.20	1.64/1.44	0/0	Rich (0/4)
Representation	Darstellung	28/48	2.68	1.36/1.28	0/0	Darling (0/4)
Research	Forschung	172/99	3.12	1.48/1.36	0/0	Fortune (5/0), Forest (0/3)
Resolve	Entschluß	2/1	2.48	1.28/1.20	0/0	Enter (0/3)
Rice	Reis	24/48	6.68	5.64/5.16	8/9	Rise (3/5)
River	Fluß	183/42	6.28	1.64/1.40	0/0	Flush (5/0), Flu (0/7)
Roll	Brötchen	23/9	5.44	1.44/1.40	0/0	Broken (10/8)
Roof	Dach	64/34	5.80	1.40/1.28	0/0	Dash (5/3), Dutch (0/3)
Room	Zimmer	439/132	4.96	1.48/1.32	0/0	Simmer (7/11)
Rug	Teppich	17/24	6.56	1.64/1.28	0/0	Tip (4/0)
Rule	Regel	148/84	2.84	2.96/2.84	0/0	Regal (10/9)
Ruler	Maßstab	13/0	5.56	1.32/1.80	0/0	Stab (2/8)
Rumor	Gerücht	14/24	2.20	1.48/1.16	0/0	Gross (0/3)
Salesman	Verkäufer	32/10	4.96	1.52/1.08	0/0	Cough (0/3)
Satisfaction	Genugtuung	32/12	3.12	1.36/1.16	0/0	Tongue (3/5)
Secret	Geheimnis	52/37	3.52	1.16/1.20	0/0	Germs (0/3)
Selection	Angebot	54/198	2.28	1.28/1.20	0/0	Angel (6/7)
Shepherd	Schäfer	5/4	4.56	3.40/3.08	0/0	Shaver (0/5)
Ship	Schiff	126/96	5.88	4.44/3.84	0/0	Shift (5/8)
Shirt	Hemd	29/25	5.56	1.56/1.84	0/0	Hem (12/10)
Shoe	Schuh	58/33	5.68	4.44/4.40	5/6	—
Shot	Schuß	90/48	4.44	2.76/2.36	0/0	Shoe (6/4), Scrub (0/4)
Shove	Stoß	0/10	4.48	2.68/2.68	0/0	Stop (8/12)
Side	Seite	476/637	2.84	4.72/3.60	0/0	Site (5/0), Seat (0/8)
Sign	Zeichen	142/78	4.32	2.80/2.32	0/0	—
Size	Größe	148/74	3.72	2.04/1.48	0/0	Gross (9/4), Grab (9/4)
Skin	Haut	53/49	5.92	1.12/1.24	0/0	Hot (10/8)
Sky	Himmel	72/81	6.00	1.12/1.24	0/0	Hammer (5/8)
Slope	Böschung	27/3	4.08	1.56/1.12	0/0	Boss (3/4)
Smile	Lächeln	56/0	6.44	1.44/1.20	0/0	Lock (0/3)
Snack	Imbiß	9/2	4.80	1.44/1.28	0/0	Embassy (3/0)
Snake	Schlange	70/18	6.52	2.56/2.16	0/0	Slang (6/5)
Snow	Schnee	56/41	6.16	3.36/3.52	0/0	Knee (10/9)
Society	Gesellschaft	281/254	3.12	1.36/1.24	0/0	Shaft (5/0)
Solution	Lösung	88/169	2.48	1.96/1.28	0/0	Loser (3/0), Song (0/3)

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Song	Lied	129/48	4.88	1.36/1.36	0/0	Lead (9/0), Lie (0/6), Lied (0/6)
Spear	Spieß	5/5	4.64	3.40/3.52	0/0	Species (6/0), Spy (6/10)
Spoon	Löffel	6/6	5.36	1.92/1.52	0/0	Loft (5/4)
Spring	Frühling	138/20	5.16	1.60/1.44	0/0	Fruit (3/0), Fling (0/3)
Spy	Spitzel	9/3	5.08	2.76/2.48	0/0	Spit (10/7)
Square	Quadrat	121/5	6.40	2.08/2.24	1/1	Quadrant (12/8)
Stage	Bühne	224/56	5.88	1.16/1.20	0/0	Bun (10/5)
Start	Anfang	61/170	2.63	1.24/1.08	0/0	Fang (7/9)
State	Staat	1421/494	4.60	5.60/4.88	3/3	Statistic (11/5)
Stocking	Strumpf	6/11	5.60	2.12/2.24	0/0	Stump (12/6)
Stomach	Magen	41/13	5.08	1.28/1.28	0/0	Megan (4/0), Imagine (0/3), Magic (0/3)
Stone	Stein	66/60	5.44	3.92/4.16	0/0	Stain (4/5), Mug (4/0)
Store	Geschäft	102/108	3.72	1.68/1.32	0/0	Guess (3/5), Shaft (3/0)
Story	Geschichte	212/173	4.76	1.24/1.24	0/0	—
Stranger	Fremde	50/0	4.20	1.40/1.28	0/0	Framed (4/0), Friend (0/10)
Street	Straße	323/267	5.68	2.92/3.16	0/1	Straw (5/0), Strap (0/3), Strobe (0/3)
String	Schnur	34/4	5.00	1.56/1.92	0/0	Sure (7/0), Snore (0/5)
Success	Erfolg	116/284	3.00	1.60/1.28	0/0	Fog (6/5), Ear (0/5)
Suggestion	Vorschlag	57/214	2.32	1.44/1.24	0/0	Force (3/0), Flag (0/3)
Suitcase	Koffer	25/21	5.48	1.88/1.40	0/0	Coffee (11/7), Coffin (11/7)
Sun	Sonne	117/90	6.36	5.60/4.84	8/5	Song (7/0), Son (0/7)
Support	Unterstützung	132/87	2.08	1.56/1.75	0/0	Understand (7/10)
Surprise	Überraschung	49/35	4.04	1.44/1.20	0/0	Embarrassing (0/3), Umbrella (0/3)
Swamp	Sumpf	7/8	5.92	3.60/3.52	0/0	Some (3/0), Stump (3/3)
Sweat	Schweiß	22/15	4.56	3.00/2.80	0/0	Swiss (4/0), Swab (0/3)
Table	Tisch	242/100	5.80	2.16/3.16	0/0	Teach (2/3)
Taste	Geschmack	60/22	3.12	1.32/1.48	0/0	Smack (6/7)
Teacher	Lehrer	152/116	5.84	2.88/2.56	0/0	Letter (7/9)
Television	Fernseher	51/3	6.72	1.60/1.44	0/0	Furniture (6/9)
Tenant	Pächter	14/4	4.08	1.32/1.20	0/0	Patch (7/4)
Test	Prüfung	161/50	4.12	1.60/1.12	0/0	Profound (6/10)
Thumbtack	Zwecke	0/0	5.44	1.52/1.12	0/0	Week (5/0), Wreck (0/5)
Tooth	Zahn	123/33	5.88	1.64/1.56	0/0	—
Toy	Spielzeug	14/6	5.63	1.52/1.36	0/0	Spill (4/5)
Train	Zug	86/120	6.24	1.76/1.24	0/0	Bug (4/5)
Umbrella	Schirm	11/6	6.24	1.68/1.36	0/0	Squirm (6/10)
Vacation	Urlaub	55/46	5.64	1.56/1.24	0/0	Lab (8/6), Urban (0/6)
Vegetable	Gemüse	26/15	5.60	1.68/1.24	0/0	Gem (5), Moose (4)
Vicinity	Nähe	6/120	2.20	1.36/1.28	0/0	Night (3/0), No (0/4)
Victory	Sieg	68/151	4.52	1.44/2.00	0/0	Siege (7/0), Sing (0/6)
View	Aussicht	217/58	3.00	1.12/1.24	0/0	—
Village	Dorf	84/95	4.88	1.84/1.52	0/0	Dwarf (9/11)
Visitor	Besucher	49/64	4.52	1.64/1.52	0/0	Butcher (4/0), Sucker (0/3)
Voter	Wähler	24/32	4.48	2.88/1.68	0/0	Whale (5/0), Water (0/9)
Waiter	Kellner	15/11	5.20	1.44/1.48	1/0	Killer (6/8)
Waitress	Kellnerin	3/4	5.52	1.76/1.60	1/0	Kettle (4/4), Killer (0/4)
War	Krieg	492/315	5.29	1.68/1.72	0/0	Cry (4/0), Keg (4/0), Craig (0/4)
Waste	Ausschuß	31/13	3.92	1.36/1.52	0/0	—
Water	Wasser	486/84	6.29	4.72/3.92	3/1	Washer (5/0), Waste (0/4)
Way	Weg	1027/425	2.36	3.12/2.88	0/0	Wig (5/6)
Weakness	Schwäche	52/33	2.84	1.52/1.20	0/0	Watch (8/6), Sandwich (0/6)
Weather	Wetter	70/65	4.40	5.36/4.80	2/0	Wetter (7/0), Wet (0/6)
Week	Woche	425/375	3.54	3.40/3.84	0/0	Watch (4/4)
Wheel	Rad	77/43	6.12	1.56/1.40	0/0	Red (7/0), Rad (0/8)
Window	Fenster	172/89	5.84	1.80/1.44	0/0	Fence (12/11)
Wing	Flügel	44/28	4.56	1.40/1.24	0/0	Flute (7/0), Frugal (0/6)

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Appendix 4 (*continued*)

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Wish	Wunsch	34/166	3.33	3.64/3.68	0/0	—
Woman	Frau	467/709	5.76	2.00/1.72	0/0	Fraud (4/7)
Wood	Holz	76/46	6.33	1.52/1.28	0/0	Hole (8/0), Hold (0/12)
Work	Arbeit	680/532	4.20	1.72/1.48	0/0	Orbit (6/0)
World	Welt	832/979	5.52	2.48/2.48	0/0	Welt (8/7)
Yarn	Garn	20/4	6.00	4.68/3.80	7/10	Barn (3/3), Garnish (3/3), Gone (3/3)
Zipper	Reißverschluß	1/2	6.21	1.36/1.00	0/0	Reverse (10/10), River (10/10)

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