New perspectives on old alternations

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1. Introduction

A thoroughly investigated area in syntactic research is what have often been considered transformationally related alternations; consider (1), (2) and (3) for examples of particle placement, dative shift and preposition stranding respectively.[1]

(1) a. He picked up a pencil, [...] (W2F-004 #087:1)
b. [...] he didn't want me even to pick the child up (S1B-049 #083:1:B)

(2) a. but I'll give him a ring (S1A-058 #084:2:B)
b. [...] he gave a similar title to the third collection (S2A-036 #095:1:A)
c. [...] I'll sell up and buy a flat for Emily and myself (W1B-010 #072:2)

(3) a. Is that from where you get the optic nerve (S1B-015 #158:1:C)
b. I know where I got that one from (S1A-007 #125:1:A)

In order to explain why speakers choose one construction over the other, many if not most previous studies of such alternations have mainly focused on the following characteristics of the constituents involved in the alternation.

- phonological determinants, e.g. the stress of the DO in (1);
- syntactic determinants, e.g. the constituents' word classes and their relative lengths and complexity;[2]
- pragmatic determinants, e.g. the givenness and/or inferrability as well as the importance of the constituents' referents.

Many might hold that, given the vast amount of literature on the above alternations, a further study is exactly what we need least, especially since once such an alternation is investigated from a multifactorial perspective, the joint predictive power of all factors proposed so far can be very high (cf. Gries [2003] for such an analysis of (1)) and conforms to the kind of results obtained by experimentation (cf. Gries [to appear] on (2)). However, there are also determinants whose influence on alternations have not

[1] All examples are from the British component of the International Corpus of English.
[2] The lengths of constituents could also be considered a phonological variable, but most authors have opted for a syntactic operationalization of length.

been analyzed as thoroughly, three of which are analysed here: (i) structural priming, i.e. the tendency to reuse recently produced constructions (cf. Bock [1986]); (ii) the phonological make-up of the verbs and particles in verb-particle constructions; and (iii) lexical bias (or verb disposition; cf. Stallings et al. [1998]). I will (a) investigate naturally-occurring data from the manually parsed International Corpus of English (GB) as to how much these determinants contribute to the explanation of particle placement and dative shift and (b) discuss some implications of the findings.

2. Case studies

2.1 Structural priming

The notion of structural (or syntactic) priming refers to the fact that speakers exhibit a tendency to re-use particular syntactic patterns. For example, early studies of this phenomenon (Bock [1986] and Bock and Loebell [1990]) found that actives and passives prime themselves as do ditransitives and prepositional datives. Later studies then focussed on (some of) the following questions.

First, is the strength of priming effects medium-dependent and/or construction-dependent? Most studies focused on priming effects in spoken production, but, to give just one example, Pickering and Branigan (1998) report priming effects in written production, too. Also, priming effects were observed for active vs. passive and ditransitive vs. prepositional datives in English and Dutch, and Potter and Lombardi (1998, exp. 3) found that datives prime stronger than transitives.

Second, is the strength of priming of a syntactic pattern dependent on the way the speaker has encountered the syntactic pattern before (production vs. comprehension)? While most experimental studies had subjects read *and* produce primes, testing production-to-production priming, Branigan, Pickering and Cleland (2000) report evidence for comprehension-to-production priming.

Third, what determines the duration of priming effects? In some studies, priming (in written production) was rather short-lived (Branigan, Pickering and Cleland [1999]). In others, priming effects were found (in spoken production) over ten intervening sentences (Bock and Griffin [2000]), and Branigan et al. (2000) found that neither temporal gaps nor intervening linguistic material results in weaker priming effects (in spoken production).

Finally, and most importantly, are the obtained priming effects really structurally motivated or are they also influenced by semantic/thematic, metrical or other utterance characteristics? Early works suggested that

priming effects derive from phrase structure representations only. More recently, however, Hare and Goldberg (1999) demonstrated that Bock and Loebell (1990, exp. 2) had not controlled for the lexical effect (the presence of *by*) and that the semantics of the constructions also contribute to the observed priming effects.

The following section will look at particle placement and dative shift to address these four questions from a corpus-based perspective.

2.1.1 Verb-particle constructions (VPCs) in the ICE-GB

To determine if structural priming influences the choice of VPCs, I extracted the VPCs represented in Table 1 from the ICE-GB corpus, coding each example with the speaker identifier and the medium of the example (spoken vs. written). Apart from MEDIUM and CONSTRUCTION, the following variables were then also included into the analysis: (i) for spoken data, the variable SPEAKER: does it make a difference for priming whether we only count two consecutive constructional choices by the same speaker ('same') or whether we also include cases where both choices were made by different speakers ('same/different')? (ii) the variable DISTANCE: how large is the distance between the two consecutive constructions (measured in 0, ≤1, ≤2, ≤3, ≤4, ≤5, ≤6, ≤7, ≤8, ≤9, ≤10, ≤15, ≤20, ≤25 and ≤∞ parse units within each subtext of each file)?

Data in the ICE-GB	V Prt NP	V NP Prt	row totals
spoken	698	963	1,661
written	553	229	782
column totals	1,251	1,192	2,443

Table 1: Verb-particle constructions: MEDIUM × CONSTRUCTION

The effect of priming was then measured as in Pickering and Branigan (1998: 638). For each distance, I computed the conditional probability p (target construction = X | prime construction = X). From this conditional probability I subtracted the overall relative frequency of the construction X for this medium. As an example, consider Table 2, which represents the observed frequencies of pairs of VPCs in the ICE-GB and the ratio of priming vs. non-priming cases for the following configuration of variables: MEDIUM: 'spoken', DISTANCE: '≤6', SPEAKER: 'same.'

constructional choices		2nd occurrence of a pair ('target')		row totals
		V Prt NP	V NP Prt	
1st occurrence of a pair ('prime')	V Prt NP	.626 (92)	.374 (55)	1 (147)
	V NP Prt	.229 (52)	.771 (175)	1 (227)
overall construction probabilities		.42	.58	1

Table 2: Observed frequencies and ratios of pairs of VPCs

The circled figures are the conditional probabilities for the successfully primed constructions (and their raw frequencies). Here, the conditional probability of V Prt NP as a target when the last VPC was also V Prt NP is .626. To identify whether this probability is an improvement over the base line for this construction (.42), the difference .626-.42=.206 is computed, indicating that the conditional probability of occurrence of V Prt NP is about 20% higher after V Prt NP than after V NP Prt; i.e., negative differences would indicate a lack of priming. Analogous analyses for all 60 MEDIUM × DISTANCE × CONSTRUCTION configurations yielded the results in Figure 1; SPEAKER is omitted, since it had no effect at all.

Structural priming has a strong effect: knowing a speaker/writer's previous constructional choice improves one's prediction accuracy by 17.36%. But let us look at the results in more detail. First, there is a significant effect of MEDIUM: with the exception of DISTANCE: '0', priming in speaking is nearly twice as strong as in writing ($F_{1,\ 30}$=2598.9; p<.001; partial η^2=.989), but there is also an interaction of MEDIUM × CONSTRUCTION such that there is no priming effect of V Prt NP in writing ($F_{1,\ 30}$=5092.46; p<.001; partial η^2=.994). Second, priming is inversely (logarithmically) proportional to the distance between the two constructions ($F_{14,\ 30}$=165.95; p<.001; partial η^2=.987);[3] but V NP Prt primes with small distances and successively weaker with longer distances whereas V Prt NP has priming ratios below zero for short distance and intermediate ones across the remaining distances (for DISTANCE × CONSTRUCTION: $F_{14,\ 30}$=401; p<.001; partial η^2=.995). Finally, the constructions differ with respect to the degree of priming: V NP Prt is primed more than 2.5 times stronger than V Prt NP: $F_{1,\ 30}$=6770.48; p<.001; partial η^2=.996.

[3] Average priming ratio = $-.018 \cdot \log_{10}(\text{distance}) + .165$ (R^2=.745; $F_{1,\ 13}$=37.9; p<.001); for this, the value for 0 parse units was recoded as 1E-7, that for the maximum number of parse units to 99.

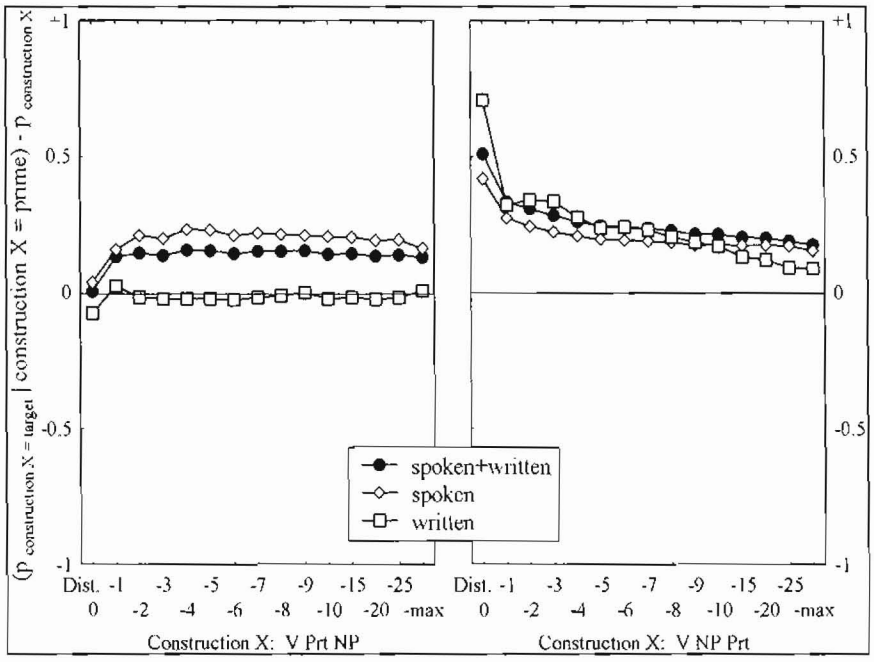

Figure 1: MEDIUM _ DISTANCE _ CONSTRUCTION: Structural priming of VPCs

2.1.2 Dative shift in the ICE-GB

For the analogous investigation of dative shift, I extracted all prepositional datives and ditransitives from the ICE-GB, obtaining the distribution in Table 3.

Data in the ICE-GB	V NP $PP_{for/to}$	V NP/S NP/S	row totals
spoken	926	1254	2,180
written	854	759	1,613
column totals	1,780	2,013	3,793

Table 3: Ditransitives and all prepositional datives: MEDIUM × CONSTRUCTION

On the basis of the methodology outlined in the previous section, I computed the differences of the conditional probabilities and the relative frequencies in the corpus for each of the 60 configurations of MEDIUM, DISTANCE and CONSTRUCTION of dative constructions; the results are represented in Figure 2. Again, there is a pronounced overall effect of structural priming (average improvement = 17.44%) with numerous individual results: The effects of MEDIUM and MEDIUM _ DISTANCE indicate that, in

speaking, priming is about 30% stronger than in writing ($F_{1,\ 30}$=125.31; p<.001; partial η^2=.807 for MEDIUM). As to the main effect of DISTANCE, the strength of priming is again inversely logarithmically proportional to the distance between prime and target ($F_{14,\ 30}$=42.22; p<.001; partial η^2=.952).[4] While the ditransitive yields average priming effects significantly surpassing those of the prepositional constructions by 48% (across all distances; $F_{1,\ 30}$=268.25; p<.001; partial η^2=.899), this effect is qualified by the interaction MEDIUM _ CONSTRUCTION ($F_{1,\ 30}$=777.77; p<.001; partial η^2=.963): in spoken language, the prepositional constructions are primed more strongly and in writing the ditransitives are primed more strongly.

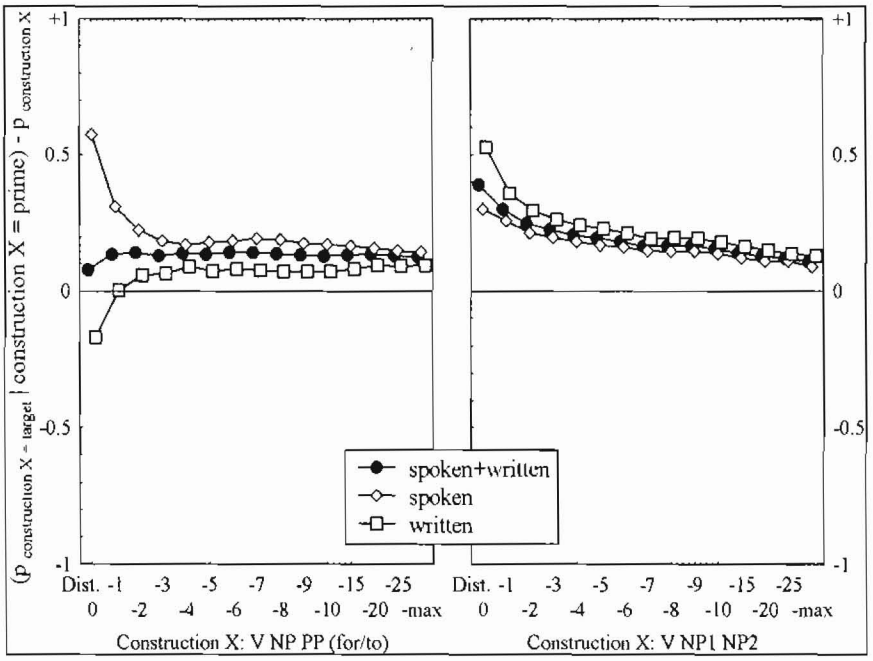

Figure 2: MEDIUM _ DISTANCE _ CONSTRUCTION: Structural priming of datives

2.1.3 General discussion and priming in corpora

Sections 2.1.1 and 2.1.2 discussed results resembling those of many experimental studies, the former even illustrated priming effects for an alternation previously not known to be subject to priming. But let us return to

[4] Again, there is a logarithmic relation between strength of priming and Distance; average priming ratio = $-.021 \cdot \log_{10}(\text{distance}) + .175$ (R^2=.81; $F_{1,\ 13}$=56.75; p<.001); the computation was as above.

the questions raised above and, at the same time, attempt to validate the present approach.

As to MEDIUM, we find that priming effects are much stronger in spoken language. This is what one would have expected, tying in well with Branigan et al.'s (2000) finding that priming in speaking is more robust than in writing.

As to CONSTRUCTION, two kinds of effects are worth mentioning. From an inter-constructional perspective, datives prime about as strongly as the transitive phrasal verbs in VPCs. From the more interesting intra-constructional perspective, note that in each alternation one construction exhibits much stronger and distance-dependent priming effects than the other, which can not be explained with reference to the (comparable) overall frequencies of the constructions. For dative shift, for example, Pickering and Branigan (1998) found a main effect of CONSTRUCTION (in the present parlance): speakers tend to produce more prepositional constructions. Similarly, in the present data, the prepositional dative was also primed more strongly in speaking, inviting the inference that it is, so to speak, the unmarked choice: Translated into the psycholinguistic terminology of Pickering and Branigan (1988), the resting activation of the link to its combinatorial node is higher and thus easier to reactivate after a first use. For VPCs, V NP Prt appears to be unmarked (given its stronger priming), which would tie in with the fact that it is acquired earlier and more frequent in the spoken medium usually given primacy in linguistic analysis; but cf. also Gries (2003: 141-3).

The finding that SPEAKER is irrelevant to the strength of priming is fully compatible with results on the intermodality of priming (cf., e.g., Branigan, Pickering and Cleland [2000]), inviting the inference that comprehension and production at least partially use identical mechanisms. As to the duration of priming (i.e. DISTANCE), the results are medium-dependent. For spoken production, the present results broadly conform to what one might expect, namely that priming decreases as the distance increases, which is fully in line the above-mentioned experimental results according to which priming can survive both long temporal gaps and intervening linguistic material; for writing, a similar finding is found for only one of the two constructions of each alternation; cf. above.

Let us finally turn to the last question, namely the one of whether structural priming is in fact mainly/only structurally motivated. While most previous experimental work has confirmed this assumption (with Hare and Goldberg [1999] also highlighting the order of semantic roles), especially the present work, with its corpus-based approach, could be criticised as being

incapable to contribute to issues of priming. For example, Branigan et al. (1995: 492) argued that

> there are several nonsyntactic factors which could lead to repetition. [...]. Corpora have proved useful as a means of *hypothesis generation*, but unequivocal demonstrations of syntactic priming effects can *only* come from controlled experiments. [my emphasis; STG]

Examples for nonsyntactic factors include lexical, prosodic and semantic repetition as well as the register and medium characteristics. I would therefore like to briefly comment on these claims. For example, not all of the potential nonsyntactic factors lend themselves to an explanation of the present results. For example, the fact that one of the two constructions may be predominant in a particular register (cf., e.g., the frequency of passives in formal settings) is taken into account here since the corpus data cover a wide variety of registers and the computation of the differences is adjusted for the overall frequencies of both constructions in the modalities of speaking vs. writing; in this connection, note that neither alternation is inherently related to a particular level of formality. Also, the effects cannot be reduced to, say, the givenness or semantic characteristics of the direct object's referent: First, both datives have information structure properties so why should only one result in priming in corpora? Second, Gries (2003: 120-1, 131) found priming effects for VPCs regardless of whether the referent of the direct object NP in the second VPC is coreferential with that of the first, and neither do the kind of animacy/argument effects observed for datives explain the results on VPCs where animacy plays no role (cf. Gries [2003: 88-9]) and the particle is often aspectual or idiomatically used and can, thus, not be attributed argument status.

Second, those who argue that the priming effects obtained from corpus data are epiphenomenal would have to explain several aspects of the above data: For instance, why do the different constructions of a pair exhibit the markedly different effects discussed above? Just like the general results, this difference cannot simply be attributed to lexical bias since, in that case, one would expect to find strong priming effects for prepositional datives (since here the prepositions allow for the lexically-based priming bias noted by Hare and Goldberg [1999]). But, again in accordance with experimental findings, it is actually the ditransitive where priming is significantly stronger across both mediums. Also, the large numbers of intervening sentences for which priming is observed together with the fact that lexical activation decays too fast make it unlikely that at times long duration of effects is just a lexical memory effect. Finally and most importantly, the present results mirror those of Pickering and Branigan (1998) *even if* verb identity of prime and target is included as a factor in the analy-

sis: when the verbs in prime and target are identical, then priming is significantly stronger than if they are not, but even in the latter case significant priming is obtained.

In sum, since the present findings strongly resemble those obtained experimentally, they cannot be explained away as easily as suggested. Without doubt, further (experimental) evidence is necessary, but it seems as if the utility of corpus-based, explorative results (cf. Branigan et al.'s [1995] quote) of research into priming effects (of VPCs) should not be underestimated prematurely.

2.2 Rhythmic alternation: Verb-particle constructions

According to the principle of rhythmic alternation, stressed and unstressed syllables tend to alternate such that (i) two adjacent stressed syllables and (ii) longer sequences of unstressed syllables are avoided (cf. Couper-Kuhlen [1986: 60]). It is unclear whether this is a universal principle, but there is strong evidence for its importance for morphological variation in English (cf. Schlüter [2003]). However, with respect to the classic cases of syntactic variation listed above, there are no systematic studies of the influence of rhythmic alternation – in fact there are only few empirical studies of syntactic variation concerned with phonological determinants at all which go beyond simply postulating some phonological influence. One of these is Browman (1986), who investigates phonological factors governing particle placement (initial particle segments, stress patterns and syllabic lengths of direct objects) and comes to the conclusion that the only phonological factor conditioning particle placement is the type of initial segment of the particle (vowel vs. consonant).[5] But since Browman (1986) restricted her studies of stress only to the direct object of VPCs, it is possible that other patterns escaped her notice. The following section will therefore investigate the degree of cohesion between the verb and the particle for one syntactic pattern of VPCs.

Given the above characterization of rhythmic alternation, one can derive some predictions for the frequency of V Prt NP, which are summarized in Table 4: '×' and '_' represent stressed and unstressed syllables respectively while '-' and '+' indicate that V Prt NP violates or obeys the principle of rhythmic alternation respectively; in the former case one would expect V Prt NP to be less frequent than V NP Prt – in the latter case, V Prt NP is possible or could even be preferred.[6] For example, the combination [$_V$ ×]

[5] A similar result was obtained for the data summarized in Table 2; _=.166; p<.001.

[6] For reasons of complexity, I cannot address the degree to which the stress patterns and the syllabic lengths of the direct object NP interact with verb and

[Prt ×] is a dispreferred sequence of two stressed syllables, as is [V _ ×] [Prt × _], and [V × _ _] [Prt _ _×] results in a too long sequence of unstressed syllables, which is why V Prt NP should be dispreferred.

verb \ particle	×	× _	_ ×
×	-	-	+
× _	+	+	+
_ ×	-	-	+

verb \ particle	×	× _	_ ×
× _ _	+	+	-
_ × _	+	+	+
_ _ ×	-	-	+

Table 4: Rhythmic alternation predictions for V Prt NP

For all 2,443 verb-particle constructions, I classified the verbs and particles according to their number of syllables and stress patterns to test the above predictions. Unfortunately, however, even 2,443 constructions proved to be much too few to test some of the predictions. Still though, most tests possible support the principle of rhythmic alternation. As a first example, consider Table 5 for the 1,621 cases where the phrasal verb consists of the supposedly dispreferred sequence of a monosyllabic verb and a monosyllabic particle. When the observed construction frequencies for [V ×] [Prt ×] are compared to the expected ones, V Prt NP is in fact significantly dispreferred ($p_{binomial}$=.035, as computed with R 1.6.2).

	V Prt NP	V NP Prt	total
observed for all constructions	1,251 (51.2%)	1,192 (48.8%)	2,443 (100%)
observed for [V ×] [Prt ×]	793 (48.9%)	828 (51.1%)	1,621 (100%)
expected for [V ×] [Prt ×]	830.1	791.9	1,621 (100%)

Table 5: Rhythmic alternation: The distribution of VPCs of the form [V ×] [Prt ×]

As a second example, let us look at [V ×] [Prt × _], where again V NP Prt should be preferred. This is indeed the case although the observed distribution of 32:42 (expected: 37.9:36.1) fails to reach standard levels of significance ($p_{binomial}$=.105).[7] While [V ×] [Prt × _ _] can unfortunately not be tested since the only trisyllabic particle has medial stress (cf. again n. 6), we can of course test the predicted overall avoidance of two adjacent stressed syllables in V Prt NP by collapsing all verb/particle lengths and

particle stress patterns and lengths in much detail. Also, since there is only a single trisyllabic particle (*together*), I cannot investigate predictions for trisyllabic particles in any satisfactory way.

[7] As in Table 5, the first frequency is that of V Prt NP, the second that of V NP Prt.

inspecting all 1,710 cases where the verb and the particle bear their stress on their final and first syllable respectively: from the frequencies of the constructions alone, 875.6:834.4 would have been expected, but we find a significant distribution of 830:880 ($p_{binomial}$=.014) in the direction predicted by the principle of rhythmic alternation.

Third, for the configuration [$_V$ × _] [$_{Prt}$ ×], where V Prt NP guarantees a rhythmic alternation for the verb-particle sequence, we do indeed find the expected highly significant preference of V Prt NP (319:167; $p_{binomial}$=9E-11).

Finally, let us turn to a configuration where Table 4 makes no strong avoidance prediction, namely [$_V$ × _ _] [$_{Prt}$ ×]. This pattern would not violate rhythmic alternation, but we might still expect a prevalence of V Prt NP: most direct objects start with an unstressed syllable,[8] so V NP Prt would result in three consecutive unstressed syllables, a violation of rhythmic alternation which could be avoided by choosing V Prt NP. This is supported since the distribution (19:9) is in fact marginally significant in the predicted direction ($p_{binomial}$=.057).

Rhythmic alternation also manifests itself strongly with progressive verb forms. As 92% of the particle tokens in my data bear stress on their initial syllable, one would expect the unstressed *-ing* of progressives to allow V Prt NP more readily. The corpus data show that V-*ing* Prt NP and V-*ing* NP Prt occur 245 and 148 times respectively, ($p_{binomial}$<.001), a finding difficult to explain any other way.[9]

In sum, while the number of predictions that could be tested is admittedly smaller than desired, all of the predictions that could be tested were either significantly or marginally significantly confirmed; no prediction was dis-

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[8] About 55% of the direct objects start with one of the following words: *a(n), the, this, that (det.), these, those, my, your, his, her, its, our, their, me, you, him, us, them.*

[9] Len Talmy (p.c.) suggested that, according to this logic, rhythmic alternation should also be reflected in a preference of verbs with the [Id] past tense allomorph in V Prt NP, and, by analogy, this should also hold for present tense [Iz]. However, these cases turned out to be very rare (23:23; p=.493). More importantly, progressives occurred with many different verbs, but the above [Id/z] verbs were distributed much more unevenly: the most frequent of these (*point out*) already accounted for more than $^1/_3$ of the data. But given the strong preference of *point out* to take sentential objects, it is strongly associated with V NP Prt (cf. Gries and Stefanowitsch [submitted]) and the skewed distribution alone could be responsible for the lack of a significant effect. Talmy's suggestion, however, does merit a closer look at a more evenly distributed larger sample.

confirmed by the data. Thus, there does seem to be a phonological influence on a syntactic alternation.

Interestingly, the above findings also tie in nicely with two previous observations, the second of which has yet remained unexplained. First, as is well known, particle placement nearly deterministically correlates with pronominal direct objects, which virtually always require V NP Prt. The verbs of phrasal verbs are usually short native English words (75% of the verbs in the present corpus are monosyllabic; cf. Gries [2003: 22] for similar figures). In addition, the particle is usually initially stressed (cf. above). Thus, the patterns [$_V$ ×] [$_{Prt}$ ×] and [$_V$ ×] [$_{Prt}$ × _] account for about 70% of all our phrasal verbs. As we have seen, however, these patterns are significantly dispreferred so that the natural place for an unstressed, usually monosyllabic pronominal object is between the other two stressed parts of the phrasal verb, thus restoring the preferred rhythmic alternation pattern.

Second, Fraser (1974: 571) claimed that verbs not bearing initial stress prefer V NP Prt: *to divide the cake up* should be preferred over *to divide up the cake*. However, Fraser offered neither any empirical support nor an explanation for why this should be the case. With the present data, we can do both. On the one hand, Fraser's claim is supported: non-initially stressed verbs do occur in V Prt NP and V NP Prt in the ratio of 7:16 ($p_{binomial}$=.036). On the other hand, (part of) the motivation for this significant distribution may well be rhythmic alternation: 10 of these 16 cases of V NP Prt instantiate the pattern [$_V$ _ ×] [$_{Prt}$ ×], which was predicted to be dispreferred in Table 4 above independently of Fraser's claim. Again, we would need a larger corpus for a conclusive analysis of this variable, but the present data appear to allow for both a confirmation and an explanation of what has previously been mere speculation.

2.3 Verb disposition / lexical bias and distinctive collexemes

Much recent work has been concerned with the relation between individual lexemes and the syntactic structures in which these lexemes are used, i.e. the syntax-lexis interface. As to the alternations investigated here, some studies focused on a particular alternation to establish correlations between, e.g., particular verbs and their preferred syntactic structures. For example, Browman (1986) investigated VPCs with respect to, among other things, the degree to which the particle *up* and the phrasal verb *pick up* are preferred in V Prt NP. On the basis of two experimental studies, she concludes that "each verb-particle combination has its associated tendency towards contiguity or separation" (1986: 327).

In a more general vein, these issues have also been taken up in research on argument structure (cf. Levin [1993]) and in psycholinguistic studies. For

example, MacDonald et al. (1994: 685) propose that each component of a lexical entry carries information about its frequency of occurrence with particular TAM markings and in different argument structures in the language, thereby also influencing each verb's probability to occur in these constructions. Furthermore, they suggest that the frequency information stored by comprehenders also includes word co-occurrence probabilities. In a more recent experimental study, Stallings et al. (1998) explore the idea that each verb is associated with a particular constructional behaviour, which they refer to as 'shifting disposition' or 'verb disposition,' suggesting that "individual verbs carry with them information on the history of their participation in shifted structures and that this history influences the likelihood of their allowing heavy-NP shift" (1998: 396).

While the general argument of verb disposition or lexical bias is intuitively easy to grasp, it is more difficult to operationalize adequately. Stallings et al. (1998) introduce verb disposition as a frequency-based, and thus graded, notion, but their operationalization involves the absolute, and thus rather crude, distinction between verbs with a shifting bias (those that allow sentential complements) and verbs without such a bias (those that take only direct object NPs).

The present study attempts to (i) determine whether something as verb disposition does in fact exist and (ii) provide a graded and more fine-grained definition of the notion of verb disposition on the basis of Stefanowitsch and Gries (submitted). By refining traditional corpus-linguistic explorations of collocations, we developed a measure of collostruction strength,[10] i.e. a measure of the association between individual lexemes on the one hand and constructions (of various kinds of abstractness, e.g. partially filled idioms, argument structure constructions and TAM constructions) on the other hand. However, this technique (referred to as collostructional analysis) can be refined to not only identify lexemes associated with particular constructions, but also lexemes that distinguish between alternative constructions, i.e. distinctive collexemes. Since space limitations preclude a comprehensive discussion of this methodology, this paper will just briefly illustrate the descriptive potential of this new technique by looking at the alternation of ditransitives and the caused-motion construction with *to* (cf. Gries and Stefanowitsch [submitted] for details).

As a first step, (i) ditransitive constructions with nominal (as opposed to sentential) direct objects which could be paraphrased as caused-motion constructions with *to* and (ii) *to*-datives were culled from the ICE-GB cor-

[10] *Collostruction* is a blend of *collocation* and *construction*; a collexeme is a lexeme strongly associated with a construction.

pus; the final data set consisted of 1,035 ditransitives$_{to}$ and 1,700 such caused-motion constructions.[11] Then, all 288 verbs occurring in at least one of the two constructions and the frequency with which these verbs occurred in which construction were identified. As an example, the results for verb lexeme *give* are represented in Table 6.

Data in the ICE-GB	ditransitive$_{to}$	caused-motion$_{to}$	row totals
give	461 (230)	146 (377)	607
¬ *give*	574 (805)	1,554 (1,323)	2,128
column totals	1,035	1,700	2,735

Table 6: *Give* in ditransitives$_{to}$ and caused-motion constructions$_{to}$

Evidently, *give* occurs in ditransitives$_{to}$ much more frequently than expected (and much less frequently than expected in the caused-motion construction$_{to}$); put differently, *give* is a word that is highly distinctive or characteristic for the ditransitive construction rather than the caused-motion construction with *to*. But in order to compare different verbs with each other, we still need some quantitative measure. Parametric techniques such as the *z*-score or the *t*-test rely on distributional assumptions and/or minimal frequencies often violated by corpus data. Therefore, the Fisher exact test for 2×2 tables is ideally suited to our purposes, its only disadvantage being that it is computationally quite expensive. The p-value resulting from the Fisher exact test for Table 6 is 1.26E-105, showing that the predominance of *give* in the ditransitive is highly significant. Analogous tests for all 288 verbs resulted in a cline of associations of verbs to the two constructions investigated here; A strict application of the standard .05 p-value results in 16 and 47 verbs distinctive for the ditransitive$_{to}$ and the caused-motion construction$_{to}$ respectively, the twenty verbs most distinctive for each construction and their frequencies in both constructions are represented in Table 7.

Previous studies are supported: verbs have obviously strong associations to particular constructions. While Browman (1986) and Stallings et al. (1998) reported similar experimental findings for particle placement and heavy-NP shift respectively, the above corpus-based results illustrate the same tendency for dative shift, and as is demonstrated in Gries and Stefanowitsch (submitted), many other cases of grammatical variation (such as verb-particle constructions, *will*-future vs. *going-to* future, active vs. passive, to name a few examples). Also, the idea of establishing a graded measure of

[11] The *to*-datives were identified by looking for the syntactic structure [$_{VP}$ V [$_{NP}$] [$_{PP}$ *to* [$_{NP}$]]] and then manually excluding cases like *He 's got Garcia to his right* (ICE S2A-010 #105:1:A).

verb disposition is supported.

verbs distinctive for ditransitive$_{to}$		verbs distinctive for caused-motion$_{to}$	
verb lexeme (frequencies)	p	verb lexeme (frequencies)	p
Give (461 [ditr]:146 [caused-m.])	1.26E-105	put (0 [ditr]:49 [caused-m.])	5.83E-11
tell (128:2)	1.94E-53	bring (7:82)	5.86E-11
show (49:15)	2.01E-10	add (0:45)	4.07E-10
offer (43:15)	1.5E-08	attach (0:39)	7.48E-09
allow (18:0)	2.31E-08	play (1:37)	2.99E-07
cost (20:1)	4.37E-08	say (0:31)	3.57E-07
teach (15:1)	4.55E-06	limit (0:23)	1.68E-05
buy, wish (9:0)	.0002	take (12:63)	2.53E-05
earn (7:0)	.0011	commit, define (0:22)	2.72E-05
ask (12:4)	.0028	devote (0:21)	4.39E-05
promise (7:1)	.0059	pass (2:29)	7.09E-05
deny (8:3)	.0203	explain, introduce, return (0:20)	7.1E-05
afford, guarantee (4:0)	.0204	link, present, transfer (0:19)	.0001
award (7:3)	.0401	invite (0:16)	.0005
accord, cook, save (3:0)	.0541 ns	expose (0:14)	.0013
grant (5:2)	.0766 ns		

Table 7: Distinctive collexemes of ditransitives$_{to}$ / caused-motion constructions$_{to}$

Space permits only a few comments on the results in Table 7. First, *give* is in fact the by far most distinctive collexeme of the ditransitive. It is this predominance which makes it the prototypical ditransitive verb although it can occur in a variety of different constructions. Also, many of the senses the ditransitive has been claimed to have (cf. Goldberg [1995: ch. 6]) are exemplified by at least one verb (cf. Stefanowitsch and Gries [submitted] for details): *promise* (satisfaction condition), *deny* (not receiving) and *grant* (intention of receiving), *tell*, *ask* (communication as transfer) and *show* (perceiving as receiving) etc.

Second, a look at the 63 distinctive collexemes illustrates how strong individual verbs' preferences are reflected in constructional choices. Of all 2,735 tokens (in Table 6), the constructions with the 16 distinctive collexemes of the ditransitive$_{to}$ make up 992 sentences, 801 (80.7%) of which did in fact occur in the ditransitive$_{to}$ (most of the exceptions are the 146 cases of *give* in Table 6). Similarly, the 47 distinctive collexemes of the caused-motion construction$_{to}$ make up 986 cases, 943 (95.6%) of which did in fact occur in the caused-motion construction$_{to}$. This may seem as if little has been gained (since only 63 out of 288 types were included), but looking at

the tokens shows that in fact the reverse is true: the 63 distinctive collexemes make up 992+986=1,978 tokens, i.e. nearly _ of all tokens. In other words, even the few distinctive collexemes make it possible to correctly predict speakers' choices correctly in 64% of all 2,735 tokens and even 88% of all tokens with one of the 63 distinctive collexemes.[12]

Finally, the results support the basic approach of some recent construction-grammar based studies on the acquisition of argument structure constructions in terms of particular semantically light verbs in infants' input and speech. For some constructions including that investigated here, Goldberg (1999) as well as Goldberg, Casenhiser and Sethuraman (2003) explain this pattern of acquisition with reference to the raw frequencies of the verbs *give* and *put* in the ditransitive and the caused-motion construction respectively. Table 7, however, shows that *bring* and *take* are actually more frequent in the caused-motion construction$_{to}$ and should, thus, be accorded a more prominent status. But the method of distinctive collexemes goes beyond raw frequencies, thus supporting the postulated association of *put* to the caused-motion construction (in spite of *bring* and *take* being more frequent) by providing, so to say, a measure of the cue validity of a verb for a particular construction.[13] Hence, with distinctive collexemes one can identify and weigh associations between verbs and constructions, yielding results that tie in with, but also improve on, results from earlier studies on both the meanings and the acquisition of these constructions (cf. also below).

3. Summary and conclusion

The main emphasis of this paper was on demonstrating that the constructional choices for extremely well-known classical alternations have not been fully explained. While previous studies which simultaneously incorporated many determinants yielded high prediction accuracies of constructional choices (in the range of 80%), in order to improve these accuracies, more is needed than the 'usual determinants' mentioned above in section 1 as is clearly illustrated by the high percentages reported in sections 2.1 and 2.3.

As to structural priming, the vast majority of previous studies over the last 15 or so years was concerned with active/passive and datives, i.e. cases

[12] An example for a verb completely unbiased to both constructions is *send* (64:113; p=.347).

[13] Since I only discuss data for the caused-motion construction with *to* (while Goldberg and her collaborators are concerned with caused-motion constructions in general), the present results can only be preliminary; this issue is currently explored in more detail.

where both orders involve different orders of NP arguments. As in Hartsuiker, Kolk and Huiskamp (1999), however, the present results indicate that priming effects can also be obtained for cases where the alternants consist of the same phrases in different orders. While the results are in need of additional evidence (cf. the above discussion of caveats associated with corpus-based investigations of structural priming), they provide *prima facie* evidence of structural priming for a construction as yet not related to structural priming, its intermodality and its striking persistence over longer stretches of discourse, which in turn supports many previous results and recent proposals to explain priming as implicit learning.

As to rhythmic alternation and collostruction strength, the above findings underscore something that often tends to be neglected, namely the degree to which individual words need to be taken into consideration. Many studies have been concerned with delineating which verbs can undergo which alternation (cf., e.g., Gropen et al. [1989] for ditransitives and Levin [1993] for an overview), but, once we know which verbs can undergo an alternation in principle, answering the questions of which constructional choice a speaker actually makes in a particular case requires a close look at individual words' preferences, which can be motivated, among other things, by the supposedly universal tendencies of phonological structure as well as semantic/constructional characteristics of verbs. More generally, the degree of phonological influence on syntactic alternations might have to be reconsidered since results underscoring the relevance of phonological factors are accumulating. Future work could include the degree to which the phonological make-up of direct objects contributes to the choice of constructions; also, other determinants (such as ideal syllable structure) need to be investigated further (cf. again Schlüter [2003]). In addition, the observed strong bias of particular verbs to appear in some constructions rather than others is compatible with recent psycholinguistic models such as (i) MacDonald et al.'s (1994) conception of a mental lexicon whose individual entries not only list possible argument structures with which a verb can be used but also the associated relative frequencies of occurrence in such constructions or (ii) Pickering and Branigan's (1998) model, where distinctive collostruction strength corresponds to the strengths of links between lexical items and combinatorial nodes. The inclusion of all these determinants of constructional choices will enable us to explain and predict speakers' unconscious syntactic choices more adequately and more correctly than before.

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