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0. Introduction.

In this paper, the Pseudogapping (PG) construction and *do so* substitution will be discussed*. A phrase structure analysis for PG will be proposed and it will be shown to be superior to the existing transformational solutions. PG constructions are especially interesting because they undermine the classical VP-ellipsis test for VP constituency, which can be interpreted as a variant of the proform criterion if, as proposed by Schachter 1978, the auxiliary preceding the ellipsed verb is considered as a proform. The reanalysis proposed for *do so* substitution also makes it impossible to use it as a VP constituency test. This paper thus seriously undermines some of the major distributional evidence for distinguishing between VP-internal and VP-external complements.

1. Pseudogapping data.

The PG construction was studied by Levin 1986(1979) and Kuno 1981. Here are some examples:

(1) Does that annoy you? It would Ø me. (Levin, (25), p.17)
(2) The small flower-bed that as yet showed more sticks and string and labels than it did Ø flowers. (Priestly, in Visser §581)

PG is similar to Gapping in that the main verb is ellipsed in the second clause, and that there are remnants on either side of the deletion site. It is different from gapping in that there is an overt auxiliary. The latter property makes PG is similar to VP-ellipsis. PG differs from VP-ellipsis in that there is an overt VP internal remnant after the Aux (Note that I am using transformational terminology only for descriptive purposes). Both studies assume a transformational framework in which PG is obtained by deletion under identity. I will argue for a direct generation phrase structure account.

Levin 1986 collected a large corpus of spontaneous occurrences of PG in conversation. The construction is also well attested in literary usage, see for instance the numerous examples in Jespersen 1909-49, III, 12.7.4. and in Visser 1963, §573 and §580ff. One of the remarkable things about PG is the variety of possible ellipsed material. Here are a few examples from Levin and Visser, many more patterns are attested. Note that PG is more common in comparative clauses,
and that the range of ellipsed material is larger in them. However, the numerous examples of PG in non-comparative contexts, both literary and colloquial, presented by Levin and Visser, show that such non-comparative uses are in no way marginal.

(3) (V NP Prep) NP
It [an enema] leaves some water in you. At least it does Ø me. (Levin, (40), p.18)

(4) (V NP to V) NP
I'm sure I would like him to eat fruit more than I would Ø cookies. (Levin, (7), p.15)

(5) (V Part PP Prep) NP
Does it work out to about the same money on a fellowship as it does Ø a T.A.? (Levin, (22), p.17)

(6) (V to V) NP
I think you need to show yourself more than you do Ø anyone else. (Levin, (13), p.16)

The ellipsed material is not necessarily a continuous subsquence of the putative deletion controller, as is shown in the following examples.

(7) (V) NP (VP)
—Cream rinse makes my hair get dirty faster.
—It does Ø mine Ø, too. (Levin, (45), p.18)

(8) (V) NP (AP to VP)
Probably drives him crazy to have her call him all the time. It would Ø me Ø. (Levin, (26), p.17)

(9) (V) NP (to VP)
Wicked girl! ... to tempt a man to undo himself, as you have done Ø him Ø. (Richardson, quoted in Visser §582)

In all the examples presented thus far, the remnant of PG is an NP. Actually, Levin considers the NP status of the remnant as a definitory criterion for PG. Consider however the following examples with PP and AP remnants.

(10) (V) PP
Fred won't come to your house but he will Ø to mine. (Levin, (2), p.71, quoted from Postal)

(11) (V NP) AP
We consider John more intelligent than we do Ø honest.

Levin discusses (10) and denies it PG status on the grounds that it does not exhibit the informality typical of PG, and that it does not conform to the same types of acceptability conditions as PG's with an NP remnant. For the question of informality, it is simply not true that PG's are usually informal, as shown by the numerous literary examples from Visser. As for the question of acceptability conditions, Levin points out that PG's are less acceptable a) if the ellipsed clause does not have the same subject as the deletion controller; b) if the ellipsed clause is inverted; c) if the construction is not comparative. These conditions actually argue for considering (10) and (11) as PG constructions, since sentences with PP and AP remnants are also subject to them. Compare (12), (13) and (14), which are all equally unacceptable:

(12) ??John cited their analysis. Did Peter their data?
(13) ??Fred won't come to your house. Will John to mine?
(14) ??Peter considers John intelligent. Does Ann honest?

2. Deletion under identity treatments.

Levin 1986 presents a transformational deletion rule for NP remnant PG's, but it's precise formulation is clearly not a central point of her thesis, and she herself shows that it is not sufficient. I will not discuss it further here.

Kuno 1981 gives a much more technically detailed analysis, which he limits to comparatives (considering that PG is highly marked in non-comparative contexts). Kuno uses two raising transformations, X-quantifier raising and Focus of contrast raising, which raise constituents out of the VP and adjoin them to S. These transformations feed VP-deletion, which deletes what is left of the VP under identity with a preceding VP. Here is an example of a derivation. Kuno derives sentence (15) from a deep structure like (16). X-quantifier raising raises x-much mush and adjoins it to S yielding (17), and then Focus of contrast raising raises Jane and adjoins it to S yielding (18). Then VP deletion applies, deleting [give Ø Ø]VP under identity with give Mary more caviar, resulting in (15).

(15) John gave Mary more caviar than he did Jane mush. (Kuno (45b, p.144)
(16) John gave Mary more caviar than [he did [give Jane x-much mush]VP]S
(17) John ... than [the did [give Jane Ø]VP]S x-much mush]S
(18) John ... than [the did [give Ø]VP]S Jane[S x-much mush]S

Kuno's treatment raises a variety of problems. As Levin 1986 has shown (p.79), it requires VP deletion to be obligatory in many cases, after the two raising transformations. I would also like to point out that the application of VP-deletion to
(18) requires a non-standard formulation of that transformation, which Kuno (p.140) attempts (unconvincingly) to justify. Such a formulation is untenable, however, since it would allow us to derive (20) from (19) by VP-deletion, certainly not a desirable result.

(19) Whenever John [ate]_vp, Peter [ate Rice Crispies]_vp
(20) Whenever John did, Peter ate Rice Crispies.

It is not clear how the use of traces could improve the situation, since they would be coindexed with items that are not coreferential to those in the deletion controller. Another problem comes from the fact that Kuno (p.144) assumes that the two raising transformations can apply in any order, which predicts that (15) should allow a grammatical variant (15') resulting from applying Focus of contrast raising before X-quantifier raising. (15'), however, is unacceptable:

(15') *John gave Mary more caviar than he did mush Jane.


I would now like to point out that PG shares various problems that have been advanced against deletion under identity treatments of VP-ellipsis, in studies such as Webber 1979, Nash-Webber and Sag 1978.

a. Discontinuities (split antecedents) are permitted in PG, giving rise to the classical problems discussed in the above references. Consider (21):

(21) John saw Mary and Peter heard Ann, but neither did Ø me.

b. Antecedent contained proforms (see also Bouton 1970, Sag 1977) are also possible, as shown in (22).

(22) John gave a book to the girl to whom Peter did a record

c. In some cases, there is no appropriate antecedent in preceding discourse:

(23) They have a United flight from New York to Chicago every hour. I don’t know if they do Ø TWA Ø. (Levin, (1), p.12)

If you accept the bold material as a deletion controller, then you are bound to predict that anything is acceptable


I will now propose a phrase structure treatment which capitalizes on the fact that the types of possible remnants in PG are very restricted (in marked contrasts with the types of ellipsed material). More specifically, it is clear that the only types of things which can follow do or other auxiliaries are sequences of complements that are independently necessary for other verbs. Consequently, all one needs to do, for the syntax, is to assign do and the auxiliaries to the appropriate verbal subcategories, taking advantage of the existing PS rules. I will adopt the notational conventions of Gazdar et al. 1985 (henceforth GKPS), extending the range of verbal subcategories in obvious ways when necessary, and assign do and the auxiliaries to the verbal subcategories introduced by the following rules (independently necessary for the verbs given in parentheses):

(24) a. VP → H[2], NP (see)
    b. VP → H[3], NP, PP[to] (give)
    c. VP → H[5], NP, NP (give)

(25) a. VP → H[to], PP[to] (speak)
    b. VP → H[for], PP[for] (ask)

    c. VP → H[loc], PP[loc] (go)

(26) VP → H[7'], AP (seem)

For instance, assigning do and would to V[2] accounts for examples (1) and (2) above. Unlike transformational accounts, this syntactic treatment predicts that the surface order of complements after do and other auxiliaries must satisfy the usual linear ordering constraints, regardless of their order in the putative deletion controller, since they will simply be ordered by the usual LP statements. The following example shows that this prediction is correct. Consider (27c): a deletion under identity treatment would predict (27b) as the result of PG, with the PP[to] preceding the NP object, as in the deletion controller. The base generated account, however, predicts the opposite order of complements by the LP statement NP<PP, as in (27a). Clearly, this prediction is borne out.

(27) a. John said to Peter to invite more girls than he did boys to Ann.

    b. ??John said to Peter to invite more girls than he did to Ann boys.

    c. John said to Peter to invite more girls than he said to Ann to invite boys.
For the semantics, the general spirit of the treatment will be as follows. I will consider that do and the modals have denotations like the following containing a variable of type \( v_{\text{NP}, \text{VP}} \), \( v_{\text{NP}, \text{<NP, Vp>}}, v_{\text{VP}} \) or \( v_{\text{AP}, \text{VP}} \) (where \( \text{TYP}(\text{NP}) = \langle s, <s, t>, > \rangle \), \( \text{TYP}(\text{AP}) = \langle \text{NP}, \text{S} \rangle \), \( \text{TYP}(\text{S}) = \langle s, t, > \rangle \) and \( \text{TYP}(\text{VP}) = \langle \text{NP}, \text{S} \rangle \) cf. GKPS, p.193).

(28) a. \[ \text{do} = v_{\text{NP}, \text{VP}}, \text{if do is a V[2], a V[to], a V[for], ...}; \]
    \[ \text{do} = v_{\text{NP}, \text{<NP, Vp>}}, \text{if do is a V[3] or a V[5]}; \]
    \[ \text{do} = v_{\text{VP}}, \text{if do is a V[loc]}; \text{and} \]
    \[ \text{do} = v_{\text{AP}, \text{VP}}, \text{if do is a V[7]}. \]

b. \[ \text{can} = \text{can}({v_{\text{NP}, \text{VP}}}) \text{ if can is a V[2], a V[to], a V[for], ...}; \]
    \[ \text{can} = \text{can}({v_{\text{NP}, \text{<NP, Vp>}}}) \text{ if can is a V[3] or a V[5]}; \]
    \[ \text{can} = \text{can}({v_{\text{VP}}}) \text{ if can is a V[loc]}; \text{and} \]
    \[ \text{can} = \text{can}({v_{\text{AP}, \text{VP}}}) \text{ if can is a V[7]}. \]

The variables in these expressions can be instantiated to any predicate of the appropriate type present in discourse. Intuitively, the procedure is as follows. When do or another auxiliary is encountered with a subcategorization frame of the types given above, this sets off an anaphor resolution procedure, similar to that required for usual pronouns. The procedure tries to find a type VP expression V in discourse, and, if do or the auxiliary is of subcategory V[2], V[to], or V[for], constructs from it an expression of type \( <\text{NP}, \text{VP}> \) (respectively, if do or the auxiliary is of subcategory V[7]) constructs from it an expression of type \( <\text{AP}, \text{VP}> \) by replacing in any expression of type NP (respectively AP) by a variable of type NP (respectively type AP) and binding this variable by a \( \lambda \) operator. This results in a denotation of type \( \lambda p \cdot V \) (respectively \( \lambda \alpha \cdot V \)), where \( p \) (respectively \( \alpha \)) is a variable of type NP (respectively AP) and V is the result of substituting this variable for an expression of type NP (respectively AP) in V. In the case of do, the denotation is simply that obtained by this procedure. For a modal M, the denotation will be \( M'({\lambda p \cdot V}) \) or \( M'({\lambda \alpha \cdot V}) \), where \( M' \) is the denotation of M. For the cases where do or the auxiliary is V[3] or V[5], the procedure is extended in the obvious way to obtain a denotation of the type \( \lambda \rho_1 \lambda \rho_2 \cdot \lambda \alpha \cdot V \). In the case where do or the auxiliary is of subcategory V[loc], the procedure simply finds a type VP expression V in preceding discourse and, in the case of do assigns V as the semantic value of do and in the case of a modal assigns \( M'(V) \) as its semantic value.

Let us consider a few simple examples.

(29) John saw Mary and Peter did Ann.

In the interpretation of the first conjunct, we have only one expression of type VP, namely \text{saw(Mary*)}. In the second conjunct, did appears followed by a direct object, so we know that it results from an application of rule (24a) and that it is a V[2]. Since the VP expression of the first conjunct contains only one expression of type NP, viz. \text{Mary*}, the procedure instructs us to replace it by a variable resulting in \( \lambda p \cdot \text{saw}('p) \), which is thus the denotation of did in (29). Classical interpretation procedures will then result in the correct semantic interpretation for the second conjunct of that example, and consequently for the whole sentence.

(30) The President asked Congress to fund the Contras more often than he did the Salvadoran government.

(31) \text{ask('fund('Contras')) (Congress')}

(32) \text{\( \lambda p \cdot \text{ask('fund('p')) (Congress') \)}}

(33) \text{\( \lambda p \cdot \text{ask('fund('Contras')) (p) \)}}

The analysis presented here correctly predicts that (30) is ambiguous. Indeed, the relevant type VP expression is (31) which, given the assumptions of GKPS, chapter 9, is the denotation of the VP of the main clause. In this case, however, there are two ways of following the procedure described above, resulting respectively in (32) and (33) as denotations for did.

The semantic treatment sketched here is obviously both too restrictive and too lax. It is for instance incapable of accounting for cases such as (21) and (22) above, or for an example like (34); but it will allow (35b) as a reading for (35a).

(34) The arms were hidden by the rebels as a woman would (do) her most precious jewels.

(35) a. ??I read books about Chomsky more often than you do Gazdar.

b. I read books about Chomsky more often than you read books about Gazdar.

The acceptability contrasts between these examples show that a purely syntactically constrained solution is unlikely to be possible, though certain syntactic constraints may be relevant, e.g. making NP's islands for this process would prevent (35a) from being interpreted as (35b). But, if one attempts to account for examples like (21), (22) or (34) by simply allowing a more flexible manipulation of the semantic representation by lambda-conversion and functional composition, one will get a
much larger range of unacceptable readings. Clearly, there is also a need for pragmatic principles constraining the possible manipulations of semantic structure, in the line of those proposed by Webber 1979.

5. The problem of overgeneration.

The analysis presented here does not as such account for the differences in acceptability between the sentences in (36) and in (37): the syntax generates them, and since all of the PP's are of type NP, the semantic procedure sketched above treats them all in the same way.

(36) a. John saw Mary and Peter did Ann.
   b. ??John saw Mary and Peter did to Ann.
   c. ??John saw Mary and Peter did for Ann.
(37) a. John spoke to Mary more often than Peter did Ann.
   b. John spoke to Mary more often than Peter did to Ann.
   c. ??John spoke to Mary more often than Peter did for Ann.

How should we account for these differences in acceptability? A syntactic account is inappropriate for two reasons. First, because both the first and the second conjuncts of these sentences are well formed independent sentences, and it would be a high price to pay have to abandon the principle that a conjunction of two well formed sentences is a well formed sentence. Second, because any syntactic account, presumably based on constraints on the identity of prepositions, ruling out the unacceptable examples of (36) and (37) would also rule out (38-40) automatically.

(38) John spoke to Mary more often than Peter did with Ann.
(39) John gave Mary more books than he did to Ann.
(40) John gave more books to Mary than he did Ann records.

These sentences are, however acceptable.

A purely semantic solution is also inadequate. Since all the NP's and PP's in the examples are of type NP, it is impossible to have the semantic interpretation procedure discriminate between them.

6. An appropriateness condition on verbal proforms.

What I would like to suggest is that the acceptable or unacceptable status of these sentences is predicted by a condition of appropriateness on the use of the set of verbal proforms comprising do and the other auxiliaries (see Schachter 1978 for a justification of the treatment of these as proforms). I assume that this condition would have the same sort of status as the one predicting that the proform he is only appropriate for masculine referents ((41) is of course also valid for the other auxiliaries).

(41) The functor from the antecedent of do which applies to the denotation of the complement (respectively complements) of do (that functor is either the denotation of a verb or of a preposition) must be an appropriate denotation for that verb or preposition when it is used with a subcategorization frame comprising a complement (respectively complements) of the same syntactic category as that of the complement (respectively complements) of do. (This presupposes that such a subcategorization frame exists.)

Let me illustrate the functioning of this principle on examples (37) and (38). In all of these, the denotation of the VP in the first conjunct is spoke('to'(Mary*)) (where to' is the identity function from denotations of type NP to denotations of type NP).

For (37a), the procedure described in section 4, gives us \( \lambda p.\text{spoke}(''to'(\text{\}))) \) as the denotation for did in the second conjunct. Functional application of this denotation to that of Ann, the complement of did, followed by \( \lambda \)-conversion, gives us spoke(''to'(Ann*)). Also, condition (41) is satisfied, since the functor to' which applies to Ann* is the appropriate denotation for to when combining with an NP. (37a) is thus predicted to be acceptable with the obvious reading.

For (37b), things are much the same, except that the denotation of did is \( \lambda p.\text{spoke}(''(\text{\})\). Condition (41) is again satisfied, since the functor spoke' which applies to to'(Ann*) is the appropriate denotation for spoke when it is used with a subcategorization frame comprising a PP[to].

For (37c), the denotation of did is again \( \lambda p.\text{spoke}(''(\text{\})\). But condition (41) is not satisfied, since the functor spoke' which applies to for'(Ann*) is not the appropriate denotation for spoke when it is used with a subcategorization frame comprising a PP[for]. In the latter subcategorization frame, spoke requires a denotation spoke\( \text{\})\) that is not identical to spoke'. Consequently, this sentence is predicted to be deviant.

Sentence (38) is predicted to be acceptable with the same meaning as (37a,b). The denotation of did is \( \lambda p.\text{spoke}(''(\text{\})\). Condition (41) is satisfied.
Indeed, due to the truth conditional equivalence between *speak to* and *speak with,* the functor *spoke* which applies to *to* (Mary) is an appropriate denotation for *spoke* when it is used with a subcategorization frame comprising a PP[with].

7. Do so, do it, do that.

Let us now turn to the famous *do so* construction and the related *do it* and *do that.* In this section, I will show that *do,* in these expressions functions in an essentially different way than in the PG construction. The fundamental factor explaining this difference is the well known fact that *do,* in these expressions is an instance of main verb *do,* and not of the auxiliary. Two types of evidence for this can be given to support this. First, *do* does not commute with other auxiliaries in these constructions as shown in (42).

(42) John kicked Mary and Peter did/*can/*will so too.

Second, *do* in these constructions cannot undergo auxiliary inversion. It requires *do* support in questions, as the following examples show:

(43) John kicked Mary
(44) *Did Peter so too?
(45) Did Peter do so too?

The main verb status of *do* in these constructions accounts for two of their main characteristics. First, the fact that the gamut of possible antecedents for *do* is limited (as a first approximation) to non-static predicates in these constructions (As pointed out by Lakoff and Ross 1976(1966)) contrary to what is the case for the verbal proforms in PG. This is due to the fact that main verb *do* is not a grammatical morpheme, more specifically, that it is not a proform. Main verb *do* can refer back to any predicate included in its very wide denotation, in the same way that the noun *animal* can refer back to any noun in its denotation, as in (46).

(46) The cat ran into the attic. The animal was in a furious rage.

But since static predicates are not included in the denotation of *do,* it cannot refer back to them. Grammatical proforms do not show such constraints because their referential potential does not stem from their meaning, but from specific grammatical properties (which set them off as grammatical morphemes).

The main verb status of *do* in the *do so,* *do it* and *do that* constructions also accounts for the types of possible complements that can follow it. The classical explanation in this respect (for *do so*) is that it is a pro-VP, and that it can only be followed by VP external complements (cf. Lakoff and Ross 1976). I claim that this is not correct: the relevant factor for acceptability of a PP complement after *do so,* *do it,* *do that,* is not whether or not the corresponding complement of the antecedent verb is within the VP of the antecedent, but whether or not the PP complement is acceptable as a complement for main verb *do* with a semantic role compatible with that which the corresponding complement of the antecedent verb has with respect to the antecedent verb. Consider the following data.

(47) John kicked Mary and Peter did so to Ann
(48) ??John kicked Mary and Peter did so for Ann
(49) John spoke to Mary and Peter did so to Ann
(50) John spoke to Mary and Peter did so with Ann
(51) ??John spoke to Mary and Peter did so for Ann
(52) ??John went to Paris and Peter did so to Rome
(53) My husband put me in chains last night. It was wonderful. Has your husband done that to you lately? (J.K. Toole. A Confederacy of Dunces, Penguin, 1981, p.269).

In (47), the complement of *do* is a PP[to]. The semantic role of such complements for main verb *do* can be identified as "that which is affected by the action of the verb". This role is compatible with that assigned to *Mary,* the corresponding complement of the antecedent verb *kick.* In (48), the complement of *do* is a PP[for], which has a semantic role of beneficiary with main verb *do.* That role is, by contrast, incompatible with that assigned to *Mary by kick,* which accounts for the unacceptable status of this example. Similarly, in (49) and (50), the complements of *do* are PP[to] and PP[with]. Once again, the semantic roles of these complements with respect to main verb *do* are compatible with the role that *speak* assigns to the corresponding complement *Mary.* For (51), however, as was the case for (48), the semantic role of beneficiary is incompatible with the latter role. Consider now (52). It is unacceptable because main verb *do* never assigns a locative role to a PP[to], and only a locative role is compatible with the role of the PP[to] after *go.* Example (53) is similar to (47). Once again, the role of the PP[to] after main verb *do* is compatible with the role assigned by *put* to its direct object, which accounts for the acceptability of the sentence.

Once again, the behavior just described is in striking contrast with the role...
the verbal proforms in the PG construction. As of themselves, they assign no role whatsoever to their complements. There is thus no question of compatibility between roles assigned by them and by the antecedent.


The data discussed in this paper show that the proform criterion for constituent structure is very weak with respect to arguments about the internal constituency of the VP. Neither replacement by an auxiliary, nor replacement by do so can be used to establish the VP internal or external status of complements. Nor can the variant of this argument based on VP-ellipsis, namely, the argument that a complement is in the VP if and only if it must disappear along with the verb when VP-ellipsis applies (cf. McCawley 1988, vol.1, pp.48-49 for an example of a recent pedagogically oriented restatement of this argument, and the sentence given in footnote 2 which he uses as an example). This thus invalidates one of the major distributional arguments for such a distinction.

Footnotes

1 I would like to thank Sandy Chung, Jorge Hankamer, Bill Ladusaw, Jim McCloskey and Geoff Pullum for comments on an earlier presentation of this paper at the University of California, Santa Cruz. I am grateful to Marc Dominincy, Louise McNally and Claire Vanderhoof for comments on previous drafts.

2 Following Levin, I note the ellipsis site by "∅" and the antecedent in bold script.

3 Note that non-comparative PG sentences are still often claimed to be ungrammatical, cf. e.g. McCawley 1988, vol.1, p. 48, who stars Mary reported the driver's license number to the police, and Alice did the make of his car. McCawley does discuss PG in comparatives, cf. vol.2, p.681.

4 Kuno's analysis actually predicts that both (27a) and (27b) are equally well formed, due to the fact that Focus of contrast raising and X-quantifier raising are unordered (cf. above, §2).

5 This explains the unacceptability of Lakoff and Ross's example (16b) (John loaded a sack onto the truck and I did so onto the wagon). As for their (15b) (John gave a book to Pete, and I did so to Mary), which they consider ungrammatical, I disagree with their judgement : (15b) is certainly stilted, but there is a marked contrast with (16b), which is far worse. As for their (14b) (John took the midterm exam, and I did so the final), I agree that it is ungrammatical. This example raises the question of how to avoid direct object NP's after do so, do it, do that. The presence of the NP's it and that in the latter two, immediately accounts for this. The case of do so, however, can only be treated by looking in more detail into the exact form of the rules involved. Gazdar, Pullum and Sag 1982, p. 602, give the rule VP → H[1], so (I am silently adapting the rule to fit the GKPS framework). Given the discussion in the text, one would require further rules such as VP → H[ro], so, PP(ro), etc. In order to avoid do so with an NP object, it is sufficient not to have a rule of type VP → H[2'], so, NP.

References


