The position of clause-level syntactic functions in Spanish and its relationship with the type of clause, constituent and text

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Abstract

This paper deals with the position of clause-level grammatical functions in Spanish and its relationship with a set of variables related to the type of clause, constituent and text. The data is extracted from a linguistic database, the Base de Datos Sintácticos del español actual. The aim of the study is not to provide a theoretical explanation of the order but to provide quantitative corpus-based information about the phenomenon from a theory-neutral perspective.[1]

1. Introduction

Word order, and more specifically the order of grammatical functions, is a field that has attracted considerable attention from Linguistic Typology (Greenberg, 1966) and Pragmatics (Contreras, 1978), but has been largely left apart by traditional grammars. In Spanish, some descriptive studies exist, but they treat only certain aspects of the phenomenon, are not based on real data or do not provide frequency information. We can mention few studies, like the one by Padilla (2001), that deals with the order of constituents in oral language, from a pragmatic point of view, or some studies about the position of the subject, like Delbecque (1991) or López Meirama (1997). Most studies treat different sets of functions, clauses, language registers, geographical variants, and most important, use different types of variables and linguistic theories to describe or explain the phenomenon, which results in a very heterogeneous state of the art.

The motivation of the study is the fact that grammatical functions are an important source of ambiguity in syntactic parsing of Spanish, being the variable order of functions one of the main reasons. Thus, we expect that the information provided can be useful in the automatic analysis of Spanish.

In section 1 we present an introduction to the order of grammatical functions in Spanish, describe the database and comment some tendencies about the frequency of the orders in the database. Section 2 contains the methodological principles. Section 3 deals with the position of functions in the database. Section 4 presents some of the most important factors related to the position of functions. Section 5 contains the conclusions of the work and future lines of research.

1.1. The order of grammatical functions in Spanish

Spanish is considered to be a *flexible* SVO language. From a quantitative point of view, that means that it's not clear which orders we can possibly find attested in the language or not, and that the frequency of the different orders varies greatly.

From a qualitative point of view, the flexibility of order means that a native speaker cannot establish a clear boundary between grammatical and ungrammatical orders because its degree of grammaticality depends on multiple constraints.

The solution we adopt here consists on, first, studying only documented orders, second, paying attention to their frequency instead of their degree of grammaticality (keeping in mind that frequency and grammaticality are not equivalent concepts), and third, applying statistical tests (instead of introspection) to determine the relationship between variables.

1.2. The database

The data on which this work is based has been extracted from a linguistic database, the Base de Datos Sintácticos del español actual (BDS) (Muñiz et al., 2003). The BDS contains the syntactico-semantic analysis of 1.5 million words, totalling around 160.000 clauses, from the ARTHUS corpus, made up of American and European Spanish texts of different genres.[2] The database is made up by 160,000 rows, each of which corresponds to one clause, and several columns, that contain different type of information about the clause, its constituents and the text genre. This format facilitates the statistical treatment.

1.3. The order of grammatical functions in the database

The order of grammatical functions is defined in a broad sense, like "the way a given set of explicit grammatical functions is linearized in a clause". Thus, the order is defined not only as the position, but in a more general sense, as the number and type of "surface" functions contained in a clause, each of which occupies a position. For mere descriptive reasons, we consider that all the functions, including the verb, are at the same level. Taking the predicate as reference, grammatical functions can appear to the left of the verb (that is, in the left margin of the clause) or to the right of the verb (that is, in the right margin of the clause), with two and three slots each, respectively.

Note that the gradient concept of order and language, suggested here, has to coexist with the discrete nature of corpus analysis and linguistic concepts. Despite these difficulties, our approach allows us to see that he number of distinct orders grows as the corpus size increases, as we can see in Figure 1, where the corpus has been divided in 10 random parts and the number of orders necessary to give account of 90%, 95% and 99% of clauses has been counted in each part, as the corpus size increases in 10%.

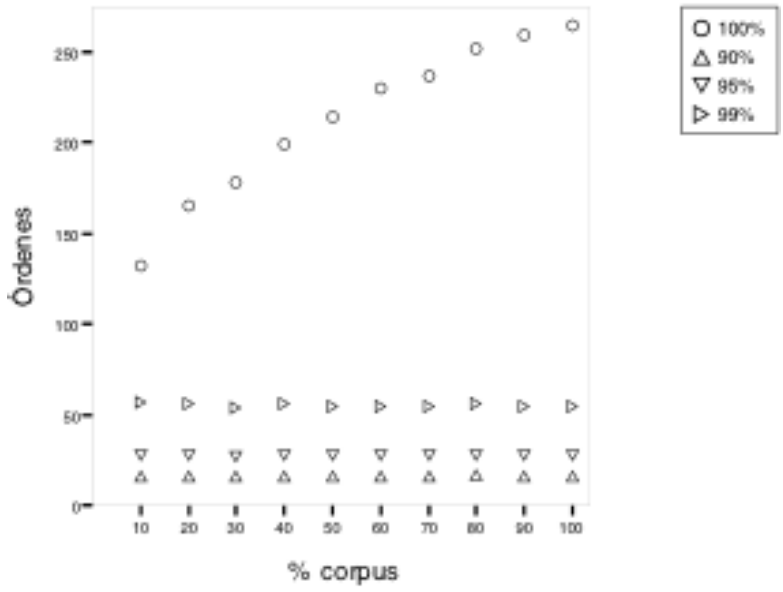

Figure 1. Number of orders that give account of 90%, 95%, 99% and 100% of clauses for 10 increasingly larger corpus samples.

However, the number of orders that accounts for 90%, 95% or 99% of clauses is almost constant. Therefore, as expected, the orders that appear as the corpus size increases are very low-frequency ones.

In addition to that, the frequency of documented orders shows a Zipf-like distribution, that is, there are a few high-frequency orders and most orders have a low frequency, as Figure 2 shows. In the database, we find 265 different orders, but the 16 most frequent orders account for 90% of clauses, the 28 most frequent ones account for 95%, and the 55 most frequent ones account for 99%. The most frequent orders and their frequency are listed in the Appendix.

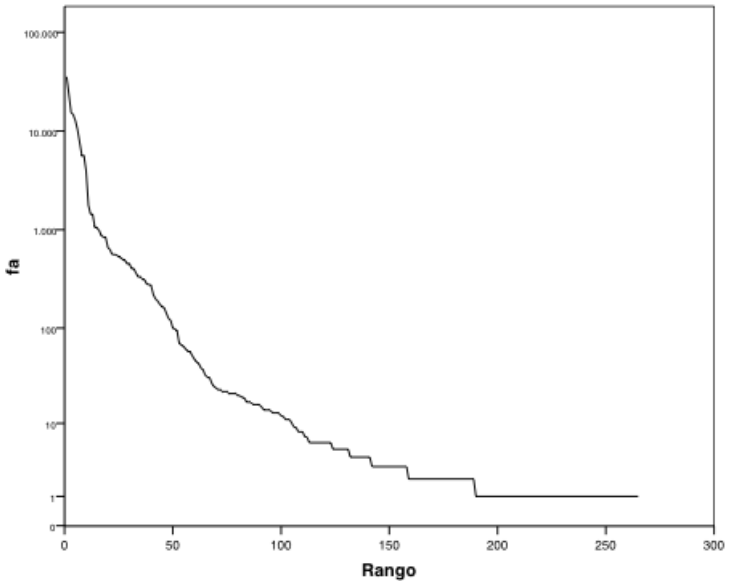

Figure 2. Rank/frequency profile of the orders in the BDS.

This variability is due to the fact that order is influenced by multiple and interacting constraints at the syntactic, semantic and pragmatic levels, as well as at the psycholinguistic level, where some constraints related to human processing and language type have been established (Köhler and Altmann, 2000). In this paper, we study the relationship between the position of grammatical functions (to the left or the right of the verb) and a set of variables related to the type of clause, constituent and text.

2. Methodology

The methodology is empirical and quantitative (Abney, (1996); Bod et al. (2003); Vulanovic and Köhler (2005)). We study (i) the frequency with which every function appears to the left or to the right of the verb (that is, in the left or right slot) and (ii) how this is related (in a statistically significant way or not, and in which degree) to a set of 53 variables, that deal with:

- The clause: type of clause, modality, status, function, polarity, voice, personality, finiteness, valence, clitics, person, number, tense and mood.
- The constituents: animation, countability, definiteness, coordination, number, presence of preposition and grammatical category.
- The text genre.

The following seven grammatical functions are considered:

- Subject (S): *La gente* comienza a abandonar el templo. (*People* start to leave the temple)
- Accusative object (D): La gente comienza a abandonar *el templo*. (People start to leave *the temple*)
- Dative object (I): He de contárselo a *Hortensia*. (I have to tell that *to Hortensia*)
- Prepositional object (R): Nunca pensó *en sus hijos*. (He never thought *about his children*)
- Subject predicative (P): Ella es *especial*. (She is *special*)
- Object predicative (O): Nadie te considera *un viejo*. (Nobody thinks of you as *an old man*)
- Passive complement (A): El primer ministro fue recibido también *por Felipe González*. (The Prime Minister was received *by Felipe González*)

For mere descriptive reasons, it is considered that all the functions are at the same level as the verb. Therefore, taking the verb as reference, grammatical functions can appear to the left of the verb (that is, in the left margin of the clause) or to the right of the verb (that is, in the right margin of the clause), with two and three slots each, respectively.

First we present the frequency data and second, we comment the relationships between the position of every function and the variables as long as they are statistically significant (according to chi-square tests) and highly correlated.

3. The position of grammatical functions

Given that Spanish is an SVO language, all the functions except the subject appear preferably to the right of the verb. As Table 1 shows, 89,5% of constituents with a grammatical function appear in the right slot.

Function	Freq.	Left	Right	Total
Direct object	a.f.	7826	59732	67558
	%	11.6	88.4	100.0
Subject	a.f.	46914	17582	64496
	%	**72.7**	27.3	100.0
Prepositional Object	a.f.	2604	27576	30180
	%	8.6	91.4	100.0
Subject Predicative	a.f.	1083	12930	14013
	%	7.7	92.3	100.0
Object Predicative	a.f.	48	4217	4265
	%	1.1	98.9	100.0
Dative Object	a.f.	1167	2715	3882
	%	30.1	**69.9**	100.0
Passive complement	a.f.	4	1113	1117
	%	0.4	**99.6**	100.0
Total	a.f.	59646	125865	185511
	%	**32.2**	**67.8**	100.0

Table 1: position of grammatical functions (left or right of the verb)

The frequency of the right slot goes from 69,9% in the case of the dative object (section 3.1) to 99,6% in the case of the passive complement (section 3.2), which makes those functions the ones with the more variable and more fixed positions, respectively.

The subject (section 3) is the only function that appears preferably to the left of the verb, in 72,7% of cases.

Finally, 83.3% of clauses in the database follow the basic pattern in which the subject appears in the left margin (if it's explicit) and the rest of functions appear in the right margin. The alteration of this pattern is mainly due (in 52.1% of cases) to the postposition of the subject. In 33.6% of cases the alteration is due to the anteposition of a different function, and in 14.3%, to both cases altogether.

3.1. The dative object

This function is the one with the most variable position in our database, since it appears to the right of the verb in 69.9% of cases, and to the left in 30.1%.

Inside the left slot, it appears in position -1 (that is, immediately preposed to the verb) in 27.4% of cases, and in position -2 in 2.7%. Inside the right slot, it appears in position +1 in 40.4% of cases, in position +2 in 29.1% and in position +3 in 0.5%.

Among the preposed dative objects, 15% are Wh- pronouns, which appear obligatorily in the left slot in Spanish (see section 4.2), and 51,8% are other type of pronouns, which appear to the left more frequently than to the right (66.2%) when they are a dative object. Those two factors (Wh- or other type of pronouns) give account of 66.8% of preposed dative objects. If we subtract those from the first figure, only a remaining 10% of dative objects appear in the left slot.

3.2. The passive complement

This function is the one with the most fixed position in our database, since it appears to the right of the verb in 99.6% of cases. In fact, we find only 4 instances (out of 1117) of passive complement in the left slot, immediately before the verb (-1).

Inside the right slot, this function appears immediately after the verb (+1) in 95.3% of cases, and in the next position (+2) in 4.4% of cases. There is no instance of a passive complement in position +3 or -2 in our database.

3.3. The subject

First, we should note that Spanish is a pro-drop language, which means that the subject is frequently omitted: overall, the subject is explicit in only 40,7% of clauses. This percentage is similar to the one we have found in the corpus CESS-ESP (Martí et al. 2007), where only 42.5% of clauses (10859 out of 25528) contain an explicit subject. However, both figures include non-finite and impersonal clauses. Taking into account only finite and personal clauses, the frequency of an explicit subject in our database raises to 49.4%. Therefore, the subject is elided in approximately half of finite and personal clauses, which contrasts with the behaviour of the subject in other languages like English and French, where an explicit subject is obligatory and is predictably the most frequent grammatical function.

When the subject is explicit, it appears to the left of the verb in 72.7% of cases. As expected, it is the only grammatical function that appears preferably to the left. It is also the function with the most variable positioning, after the dative object. Inside the left slot, it appears in position -1 in 72.2% of cases, and in position -2 in only 0.5%.

If we take a closer look to the subjects that appear to the right of the verb, they appear in position +1 in 24.2% of cases, in position +2 in 3.1% and in position +3 in only 12 cases that represents a 0.0% percentage.

In addition to that, 3.5% of postposed subjects correspond to subjects in non-finite clauses. These clauses hardly ever contain an explicit subject, but when they do, this function is almost always postposed (see section 4.3). On the contrary, the subject is postposed in only 26.6% of finite clauses.

Among the rest of postposed subjects, which appear in finite clauses, 15.7% are a clause itself. Specifically, 8.3% are a finite clause, and 7.4% are a non-finite clause. When the subject is a clause, it appears in the right slot in most cases (97.5%) (see section 4.1).

Among the rest of postposed subjects, 1.2% appears in an imperative clause, where the subject is postposed in 72.6% of cases, similarly to non-finite clauses. Again, among the rest of postposed subjects, 8.2% appear in a reflexive passive construction, where the subject is postposed in 52.8% of cases. Finally, among the rest of postposed subjects, 5.5% appear in a Wh- question or exclamation, where the subject is postposed in 51.7% of cases.

In all, the commented factors give account of 28.6% of postposed subjects of the database, and only 12542 postposed subjects are left, which reduces the remaining percentage of postposed subjects to 19.4%. Those are not a clause and appear in finite non-Wh-, non-imperative and non-reflexive passive constructions.

4. Significant associations

With respect to the relationship between the positions of functions and the set of variables, we find that, as expected, functions appear much more frequently to the right of the verb when they are a clause, and to the left when they are a pronoun, for example. Other interesting associations are found between the type of clause, constituent and text and the position of every function.

4.1. Clause constituents

All grammatical functions appear preferably in the right margin, when they are a subordinate clause. In our database, finite clauses are postposed in 99.5% of cases, and non-finite clauses in 98.0%. As Table 2 shows, that is irrespective of their grammatical function (note that only direct object, subject and prepositional object can be a clause).

Function	Clause	Freq.	Left	Right	Total
Accusative Object	Finite	a.f.	16	8976	8992
		%	0.20	**99.80**	100.0
	Non-finite	a.f.	6	3488	3494
		%	0.20	**99.80**	100.0
Subject	Finite	a.f.	38	1468	1506
		%	2.50	**97.50**	100.0
	Non-finite	a.f.	151	1316	1467
		%	10.30	**89.70**	100.0
Prepositional Object	Finite	a.f.	4	809	813
		%	0.50	**99.50**	100.0
	Non-finite	a.f.	8	3321	3329
		%	0.20	**99.80**	100.0
Total	Finite	a.f.	58	11253	11311
		%	0.5	**99.5**	100.0
	Non-finite	a.f.	165	8125	8290
		%	2.0	**98.0**	100.0

Table 2: Position of finite and non-finite subordinate clauses inside the main clause, and their grammatical function.

This fact can be explained as the result of a universal tendency (in head-initial languages), by which heavier constituents appear after lighter constituents. Syntactic weight can be measures in number of words (length) (Hawkins, 2003) or immediate nodes (complexity) (Köhler, 1999) that make up each constituent. Given that clauses generally contain more words or immediate nodes than the rest of constituents, clauses are considered as heavy constituents, and therefore have a tendency to appear in final positions.

Several universal tendencies in the ordering of constituents have been detected in the field of Linguistic Typology (for more details, see Köhler, 1999 and Köhler and Altmann, 2000), and have been confirmed by corpus data and processing experiments. Various explanations have been proposed, all of which fit within the minimum effort principle proposed by Zipf (1949). This principle consists on the tendency of the speaker to minimize the effort required by the emission of the message, finding a balance between this tendency and the need to minimize confusion by the receiver.

Thus, according to Hawkins (2003), the "increasing complexity" order is preferred because it requires less syntactic nodes to be kept in short term memory during the analysis of the message, in other words, this way the constituents can be identified faster and more efficiently, with less processing effort.

In the field of Spanish Grammar, this tendency has been mentioned by Fernández Ramírez (1951) and Hernanz y Brucart (1987), among others.

4.2. Wh- pronouns

Unlike clauses, Wh- pronouns appear in the left margin, irrespectively of their grammatical function, as Table 3 shows.

Function	Freq.	Left	Right	Total
Accusative Object	a.f.	6329	120	6449
	%	98.1	1.9	100
Subject	a.f.	11479	13	11492
	%	99.9	0.1	100
Prepositional Object	a.f.	1522	32	1554
	%	97.9	2.1	100
Subject Predicative	a.f.	588	23	611
	%	96.2	3.8	100
Dative Object	a.f.	174	1	175
	%	99.4	0.6	100
Total	a.f.	20092	189	20281
	%	99.1	0.9	100

Table 3: position of Wh- pronouns and their grammatical function.

Relative pronouns always appear in the left margin, while question or exclamative ones appear mostly in the left margin, but some cases can be found of interrogative and exclamative pronouns in the right margin. In our data, postposed Wh- pronouns are found in "eco questions" (Contreras 1999) or repetitive questions (Escandell 1999), which contain a Wh- pronoun in the original position of the complement (and some times one more in initial position).

4.3. Non-finite and imperative clauses

As expected, we find that any clause-level constituent that belongs to a non-finite clause (that is, an infinitive, gerund or participle clause) or to an imperative clause (a clause in imperative mood) is almost always postposed, irrespectively of its grammatical function. Table 4 shows the frequency of postposition of every function in both cases.

In the case of non-finite clauses, the subject is the function with the lowest percentage of postposition (93.8%), but that is still a very high percentage. All subjects (119) are postposed in gerund clauses, 95.4% in participle clauses, and 93.1% in infinitival clauses.

The anteposition of the accusative object, prepositional object and subject predicative has also been documented in our database, but no instances of preposed object predicative or dative object have been found.

Function	Non-finite	Imperative
Accusative Object	97.5	98.4
Subject	93.8	74.2
Prepositional Object	98.7	100.0
Subject Predicative	99.3	100.0
Object Predicative	100.0	100.0
Dative Object	100.0	96.1

Table 4. Position of constituents in non-finite and imperative clauses and their function.

We find a similar situation in imperative clauses, where all functions appear after the verb in more than 95% of cases, while the subject appears before the verb in 25.8% of cases. On the other hand, there is no instance of prepositional object, subject predicative or object predicative preposed to the verb in an imperative clause.

4.4. The valence of the verb

Not only the type of constituent is related the position of grammatical functions. The verbal valence (that is, the number of arguments that a verb takes)[3] can also influence the position of certain functions. In our data, the relationship between the position of functions and the verbal scheme is statistically significant in the case of the subject, the accusative object, the dative object and the prepositional object. The association is especially relevant in the case of the subject and the dative object.

The subject is preposed in more than 80% of cases with the verbal schemes [SDI], [SDR], [SDO] and [SDP], while it is postposed in 43.9% of cases with the scheme [SIP] (see Appendix 1 for the meaning of the abbreviations).

The dative object is preposed in 64.5% of cases with the verbal schemes [SI] and [SIP], while it is postposed in 85.8% of cases with the scheme [SDI].

4.5. Other associations

In this section we comment the statistically significant and highly correlated associations that exist between the position of every function and the rest of variables that have not been commented in the previous sections. We do not comment in this section the variables related to clause constituents, Wh- pronouns, non-finite and imperative clause and the valence of the verb.

With regard to the accusative object, this function is postposed in more than 97% of cases when it is a plural constituent (97.9%), a noun phrase (97.8%), an indefinite constituent (97.7%) or it is placed inside a non-Wh-clause (97.0%). On the other hand, it is preposed in 56.6% of cases when in the clause there is an accusative clitic.

With regard to the subject, this function is preposed in more than 80% of cases when it is animate constituent (80.1%) or a first person personal pronoun (81.7%). On the other hand, it is postposed in more than 40% of cases when it is in a reflexive passive clause (59.0%) in a (direct or indirect) question or exclamation (52.6%), and when the subject is indefinite (42.5%) or a plural constituent (48.4%).

With regard to the prepositional object, this function is postposed in more than 97% of cases when it is a definite (97.8%) or plural constituent (98.0%). On the other hand, it is preposed in more than 15% of cases when it is not introduced by a preposition (it is instead an adverbial constituent) (28.5%) or it is placed inside an impersonal clause with the particle *se* (17.1%).

With regard to the subject predicative, this function is always postposed when it is placed inside a passive clause, an impersonal clause with *se* or a clause with an accusative clitic. On the other hand, it is preposed in more than 70% of cases when it is placed inside a (direct or indirect) question or exclamation (73.3%), or a clause with an attributive clitic (75.0%).

With regard to the object predicative, this function is always postposed when it is placed inside a reflexive passive clause, a subjunctive clause or a clause with a dative clitic. On the other hand, it is preposed in more than 8% of cases when it is placed inside a Wh- question or exclamation (12.7%) and when it's an adverb (8.5%).

With regard to the dative object, this function is postposed in more than 90% of cases when it is placed inside a passive clause (93.1%) or a clause that belongs to a newspaper text (90.8%). On the other hand, it is preposed in more than 50% of cases when it is a non-Wh-pronoun (66.2%) or the clause has negative polarity (52.1%), medial voice (51.9%) or belongs to an oral text (61.5%).

It has not been possible to study the relationship between the variables and the position of the passive complement, because this function has a considerably fixed position and thus the number of preposed passive complements in the database (only 4) is not enough to extract statistically significant generalizations.

5. Conclusions

We have tested the relationship between the position of grammatical functions in Spanish and a set of variable related to the type of clause, constituents and text, and commented the statistically significant and highly correlated association. The main contribution of the work is, thus, the organization and simplification of the complex information related to order contained in the BDS.

The future lines of research are the following:

- Contrast our findings with other corpus of Spanish. Despite the enormous value of the BDS, the database relies on a linguistic analysis of a corpus that is necessarily determined by some external factors, like a given linguistic theory applied in the annotation, a selection of text types to be analyzed, etc. That is related to the fact that carrying out a theory-neutral description is set as a principle and it is highly desirable, but it is also limited by the fact that every corpus annotation relies on some linguistic theory and definition of units.
- The descriptive work can be a starting point for future explicative theories of the order of grammatical functions in Spanish, which should establish a hierarchy between the different factors that can influence order.
- The information provided can contribute in the future to the improvement of a parsing system of Spanish.

Notes

1 For a more extensive study on the order of grammatical functions in Spanish from a corpus-based and quantitative perspective, see Valverde (2009).

2 Part of the syntactic information contained in the BDS can be consulted online at http://www.bds.usc.es/. An extended version of the BDS, called ADESSE, enriched with semantic annotation, is accessible at http://adesse.uvigo.es/ (García-Miguel and Albertuz, 2005).

3 The concept of order is related but should not be confused with that of valency, since the latter doesn't account for the clitization or ellipsis of some functions and its position.

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Appendix

S = subject, D = accusative object, I = dative object, R = prepositional object, P = subject predicative, O = object predicative, A = passive complement.

Rank	Order	a.f.	r.f.	cum. r.f.
1	VD	35563	0.224	0.224
2	V	23946	0.1508	0.3748
3	SVD	15530	0.0978	0.4726
4	VR	14616	0.0921	0.5647
5	SV	12811	0.0807	0.6454
6	VS	10435	0.0657	0.7111
7	SVR	7610	0.0479	0.7591
8	SVP	5633	0.0355	0.7945
9	VP	5605	0.0353	0.8298
10	DV	3928	0.0247	0.8546
11	VDR	1774	0.0112	0.8658
12	DVS	1439	0.0091	0.8748
13	VO	1439	0.0091	0.8839
14	RV	1067	0.0067	0.8906

15	DSV	1047	0.0066	0.8972
16	RVS	981	0.0062	**0.9034**
17	VPS	873	0.0055	0.9089
18	SVDR	842	0.0053	0.9142
19	VA	842	0.0053	0.9195
20	VDI	664	0.0042	0.9237
21	VOD	627	0.0039	0.9276
22	PVS	563	0.0035	0.9312
23	VSD	562	0.0035	0.9347
24	VRD	555	0.0035	0.9382
25	VDS	535	0.0034	0.9416
26	VSR	524	0.0033	0.9449
27	IVS	496	0.0031	0.948
28	VDO	488	0.0031	**0.9511**
29	SVO	452	0.0028	0.9539
30	VI	450	0.0028	0.9567
31	PV	406	0.0026	0.9593
32	SVOD	401	0.0025	0.9618
33	DVR	364	0.0023	0.9641
34	VID	334	0.0021	0.9662
35	DVO	332	0.0021	0.9683
36	VRS	315	0.002	0.9703
37	SVDI	309	0.0019	0.9722
38	SVI	281	0.0018	0.974
39	SVRD	277	0.0017	0.9758
40	VSP	273	0.0017	0.9775
41	SVID	220	0.0014	0.9789
42	RVD	200	0.0013	0.9801
43	SVA	189	0.0012	0.9813
44	SVDO	176	0.0011	0.9824
45	IV	165	0.001	0.9835
46	IVD	161	0.001	0.9845
47	RSV	143	0.0009	0.9854
48	DSVO	127	0.0008	0.9862
49	SDV	119	0.0007	0.9869
50	DVI	100	0.0006	0.9876
51	VDP	98	0.0006	0.9882
52	DSVR	94	0.0006	0.9888
53	VSI	70	0.0004	0.9892
54	SRV	67	0.0004	0.9896
55	VIS	65	0.0004	**0.99**