

Discourse Constraints on Syntactic Processing in Language Production: A Cross-Linguistic Study in English and Spanish

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We present two experiments that examine how prior discourse context, and in particular the relative salience of different pieces of information, influences the syntactic structure that a speaker assigns to a subsequent utterance. In a picture description task in two languages (English and Spanish), speakers produced syntactic structures that allowed an entity made salient by a preceding discourse to precede a nonsalient entity. This tendency was stronger when the salient entity was animate than when it was inanimate. We suggest that when discourse makes one entity more salient than another, it temporarily makes that entity more accessible. We propose that such derived accessibility is additive to an entity's inherent accessibility, which is determined by its intrinsic semantic features. We discuss this approach in the light of previous work which emphasizes the importance of information accessibility in syntactic processing (e.g., Bock & Irwin, 1980; Bock & Warren, 1985; McDonald, Bock, & Kelly, 1993; Osgood, 1971; Sridhar, 1988). © 2000 Academic Press

Key Words: language production; discourse salience; syntactic processing; word order.

When speakers produce an utterance, they sometimes highlight some information as more important or salient than the rest. For example, when a speaker utters *There was this old car near a bridge, with a shattered windscreen and flat tires*, he or she introduces two new entities (a car and a bridge), but makes one of them

more salient in the discourse than the other, by mentioning it first, preceding it with a focusing structure, and providing extra information about it. This paper examines how the relative salience of information in prior discourse context influences the syntactic structure that a speaker assigns to a subsequent utterance. We report two experiments in English and Spanish that explore the hypothesis that information made salient by prior discourse is more accessible than nonsalient information and tends to appear cross-linguistically in prominent syntactic positions.

Many researchers have proposed that language production is incremental, such that more readily retrieved information is accorded priority during processing (e.g., Bock, 1982; De Smedt & Kempen, 1987; Kempen & Hoenkamp, 1987; Levelt, 1989). Under this assumption, the syntactic structure of an utterance reflects in part the order in which information becomes available during the syntactic stages of processing. Bock (1987) (see also Bock & Warren, 1985) suggested that the ease with which

The order of authors is arbitrary. The first author acknowledges ESRC Grant R00429434261. The second author was supported by a British Academy Postdoctoral Fellowship. We are grateful to the Departament de Psicologia Bàsica, Universitat de Barcelona, and especially Elisabeth Gilboy, for being so helpful and for allowing us to use their facilities. Thanks also to Charles Clifton, Martin Pickering, Richard Shillcock, Enric Vallduví, and three anonymous referees for helpful comments on the development of the work presented in this paper. Finally, thanks to Manel Garcia-Varela and Patrick Sturt for helping with the recording of the material used for the experiments presented in this paper. A preliminary version of this research was presented at the 2nd AMLaP Conference, in Torino, September 1996.

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conceptual representations can be retrieved and mapped onto syntactic structures is influenced by what she termed conceptual accessibility, or "the ease with which the mental representation of some potential referent can be activated in or retrieved from memory" (Bock & Warren, 1985, p.50). Conceptually accessible items are more easily retrieved, and so accorded priority during syntactic processing. Thus, they tend to appear in syntactically more prominent positions than less easily retrieved information.

In some theories of language production, syntactic prominence equates to higher grammatical functions (e.g., subject). In these theories, conceptual accessibility influences grammatical function assignment but cannot independently influence word order (Bock, 1987, 1995). In other theories, syntactic prominence relates to both higher grammatical functions and early word order positions. Such theories propose that conceptual accessibility can impact directly upon both grammatical function assignment and word order (e.g., De Smedt, 1990, 1994; Kempen & Hoenkamp, 1987; Levelt, 1989). One concern of this paper will be to investigate empirical evidence that can distinguish between the two alternatives.

We hypothesize that there are two determinants of an entity's overall conceptual accessibility. The first is its *inherent* accessibility, based upon its intrinsic semantic characteristics, for example animacy, concreteness, and prototypicality. There is substantial experimental evidence that inherently accessible entities tend to appear in syntactically prominent positions (e.g., Bock & Warren, 1985; Cooper & Ross, 1975; Kelly, Bock, & Keil, 1986; McDonald, Bock, & Kelly, 1993; Osgood & Bock, 1977; Sridhar, 1988). For example, many languages display a tendency for animate entities or entities with attributed humanness (e.g., dolls) to appear in early sentence positions and as grammatical subjects (e.g., McDonald, Bock, & Kelly, 1993; Prat-Sala, 1997; Sridhar, 1988). We assume that the inherent accessibility of an entity is invariant across contexts within a language.

However, we suggest that in some circumstances, an entity's inherent accessibility may be supplemented by virtue of the linguistic or

nonlinguistic context, resulting in an increase in its overall accessibility. We term this additional element *derived* accessibility. Derived accessibility is a temporary property of an entity with respect to a particular nonlinguistic or linguistic context. It may arise in a number of ways. For example, an entity may gain derived accessibility via semantic priming (e.g., Bock, 1986a). One factor which may contribute to an entity's derived accessibility, and hence its overall conceptual accessibility, is Givenness, or whether a particular entity has been previously encountered in a discourse. In a particular context, information that has been previously encountered and hence entered into a speaker's discourse model ("Given" information) should be more accessible than information that has not been previously encountered ("New" information) (e.g., Bock, 1982). Assuming incremental processing, Given information should therefore tend to appear in more prominent syntactic positions (e.g., earlier word order positions) than New information, as many theoretical linguists have proposed (e.g., Clark & Clark, 1978; Halliday, 1967; Sgall, Hajicova, & Panevova, 1986).

There is experimental evidence that Givenness in nonlinguistic contexts affects syntactic structure in production. For example, Osgood (1971) had participants describe scenes in which a range of everyday objects (such as blocks and balls) took part in various actions and stative relations. Entities that appeared in more than one successive scene were more likely to appear in early sentence positions than entities appearing in only one scene. Similarly, Prentice (1967) found that in a picture description task, entities cued by an immediately preceding picture tended to appear in early sentence positions.

Sridhar (1988) used Osgood's (1971) "simply describe" technique in experiments in ten languages. He employed a number of manipulations relating to both inherent and derived accessibility (though he did not use this terminology). These included a Givenness manipulation, in which an entity appeared either in a single scene only or in more than one successive scene. Sridhar found a cross-linguistic tendency for Given entities to precede New entities. Par-

ticipants produced more descriptions in which the patient appeared sentence-initially for scenes where the patient had appeared in preceding scenes than for control scenes. However, this effect was considerably weaker than that of his other manipulations, such as attributed humanness (cf. MacWhinney & Bates, 1978). Sridhar also found marked cross-linguistic differences in the extent of ordering effects. For example, he found more Given information–initial descriptions in languages with a canonical Subject–Verb–Object (SVO) order than those with a canonical Subject–Object–Verb (SOV) order. Sridhar's results suggest that prior nonlinguistic context affects syntax in cross-linguistic production, but that the precise manifestation of these effects may differ between languages and that other factors may have a stronger influence.

Evidence from English suggests that Givenness within the prior linguistic context may also influence syntactic processing. Tannenbaum and Williams (1968) employed a task in which participants described a picture depicting a transitive action between two entities after having read a preamble that focused on the agent, on the patient, or on neither. Active descriptions were produced faster after an agent-focused preamble, whereas passive descriptions were produced faster after a patient-focused preamble. Tannenbaum and Williams interpreted their results as a demonstration of a relationship between discourse focus ("conceptual focus" in their terminology) and syntactic structure. However, their results can also be interpreted as an effect of Given–New ordering, since the preambles introduced only one of the relevant entities.

Bock and Irwin (1980) (see also Bock, 1977) argued that Given information, as well as being conceptually more accessible (in their terms, referentially available) than New information, may also have a lexical advantage, because preceding context may provide an appropriate lexical realization for subsequent reuse—essentially a lexical priming effect (Meyer & Schvaneveldt, 1971). They found in a sentence recall task that the tendency for Given entities to claim prominent syntactic positions was increased when prior context introduced the

Given entity using the same word as that used in the target sentence rather than a synonym. This result suggests that some previous findings of apparent nonlinguistic context effects on syntactic structure could have a partial explanation in lexical priming (e.g., Sridhar, 1988).

Existing evidence is clearly compatible with our proposal that derived accessibility influences the realization of syntactic structure, but it leaves unanswered a number of questions. This paper seeks to extend the existing findings in a number of ways. First, although effects of linguistic context have been demonstrated for English, existing cross-linguistic demonstrations of context effects are restricted to nonlinguistic context; in addition, these demonstrations have not controlled for lexical priming effects. Under the model outlined above, we predict that linguistic context influences syntactic processing independent of lexical priming effects, in languages other than English. Furthermore, we propose that speakers will exploit whichever syntactic alternatives are available in their language to allow a more salient, and hence more accessible, entity to appear in a prominent syntactic position. Thus, there should be a common cross-linguistic pattern—more salient entities will claim prominent positions—but also cross-linguistic differences in the structural manifestation of this pattern.

More importantly, our experiments investigate how variations in *relative* salience affect syntactic processing. Previous experiments have considered exclusively a distinction between Given and New information. They did not consider situations in which prior context introduces more than one entity; i.e., there are multiple Given entities. Evidence from comprehension suggests that more fine-grained distinctions than a binary Given–New distinction may be relevant in processing. Thus, although Given entities may have an overall advantage over New entities, some Given entities may be more accessible than others, depending on how they have been introduced or subsequently referred to. For example, entities introduced with a proper name are more accessible for anaphoric reference than entities introduced with a full noun phrase (e.g., Sanford & Garrod, 1981;

Sanford, Moar, & Garrod, 1988). We therefore suggest that if prior linguistic context introduces more than one entity, but one entity is made prominent or salient, for example through being introduced first or introduced using a proper name, that entity should claim a prominent syntactic position in language production.

Finally, previous experiments have not explicitly considered how context effects might be mediated by the characteristics of the entities involved, that is, how derived accessibility and inherent accessibility might interact. Our model predicts that the same salience manipulations will have differential effects, depending on the inherent accessibility of the relevant entities. Hence a contextually salient animate entity will be more accessible than a contextually equally salient but inanimate entity. However, we predict that variations in contextual salience alone will be sufficiently strong to induce structural variation in the absence of inherent accessibility variations.

We investigated these issues using a picture description task. Participants first listened to short stories that introduced two entities, then described a picture depicting a transitive action involving both entities in answer to the question "*What happened?*". The stories introduced both entities, hence rendering them both Given (in Bock and Irwin's (1980) terms, lexically and referentially available), but used linguistic manipulations to increase the relative salience of one of the entities within the discourse.¹ For example, one character was introduced using the focusing existential structure *There was*, was mentioned first, was preceded by adjectives and the demonstrative *this*, and had more properties predicated of it. Previous studies have demonstrated that these manipulations affect the relative accessibility of entities in a discourse model during comprehension (Carreiras,

Gernsbacher, & Villa, 1995; Gernsbacher, 1989; Gernsbacher & Hargreaves, 1988; Gernsbacher & Shroyer, 1989; Gernsbacher, Hargreaves, & Beeman, 1989). The experiments manipulated inherent accessibility using animacy: In Experiment 1, the pictures depicted an inanimate agent and an inanimate patient; in Experiment 2, they depicted an inanimate agent and an animate patient.

We predicted that in both English and Spanish, the entity made more prominent by preceding context would be more conceptually accessible than the other entity and that this would be reflected in the production of different syntactic structures. In both languages, we predicted that stories making the agent more salient than the patient would induce canonical active descriptions like (1), where the agent appears as a sentence-initial subject.

(1) The train ran over the woman. (ENGLISH)

El tren atropelló a la mujer. (SPANISH)

In contrast, we predicted that stories making the patient salient would induce noncanonical descriptions that allowed the patient to appear in a prominent position. Thus, speakers would tend to produce passive descriptions like (2), where the patient appears as a sentence-initial subject.

(2) The woman was run over by the train. (ENGLISH)

La mujer fué atropellada por el tren. (SPANISH)

We also predicted that following patient-salient stories, Spanish speakers would additionally exploit the flexible word order to produce dislocated active structures like (3), in which the agent appears as the subject of the sentence, but the patient precedes the agent. Such a tendency is predicted by theories of language production that propose that conceptual accessibility can influence word order (e.g., De Smedt, 1990, 1994; Kempen & Hoenkamp, 1987; Levelt, 1989), but not by those that propose a link between conceptual accessibility and grammatical function assignment only (e.g., Bock, 1987; Bock & Warren, 1985).

¹ Note that in the stories, discourse salience was not differentiated from discourse focus. The use of the existential clause to introduce an entity also made that entity the focus of the discourse. However, we did not differentiate between the two possibilities because this would have forced us to make the second entity salient. If this had been the case, then we would not have been able to differentiate between discourse salience and recency effects (Chang, 1980; Gernsbacher, Hargreaves, & Beeman, 1989).

- (3) A la mujer_i la_i atropelló el tren.
to the woman_i she_i ran over the train
"The train ran over the woman."

Dislocated actives have the same grammatical functions as canonical active sentences, but a different word order. In both sentences, the agent is the subject, and the patient is the object. In a canonical active sentence, the subject precedes the verbs and the object follows the verb, yielding an SVO order (1). But in a dislocated active sentence, the subject follows the verb and the object precedes the verb, yielding an OVS order (3). Additionally, a dislocated active is morphologically marked with the addition of a bound clitic pronoun linked to the argument that has been moved from its canonical position to a fronted position (this clitic pronoun agrees in gender and number with the moved argument). Dislocated actives and passives are pragmatically equivalent with respect to presuppositional content and discourse conditions under which they might occur (Silva-Corvalán, 1983).

We further predicted that discourse salience would interact with animacy, such that the tendency for salient entities to appear in prominent positions would be stronger when the salient entity was also animate than when it was inanimate. Thus, we predicted that derived accessibility (discourse salience) would be additive to an entity's inherent accessibility: The impact of salience upon the production of a subsequent syntactic structure would be stronger when an entity was both inherently and derivatively accessible (e.g., animate entities) than when an entity was only derivatively accessible (e.g., inanimate entities).

EXPERIMENT 1

Participants

Twenty students from the University of Glasgow were paid to participate in the English conditions, and 20 students from the University of Barcelona participated in the Spanish conditions in exchange for course credits. All were native speakers of their respective language.

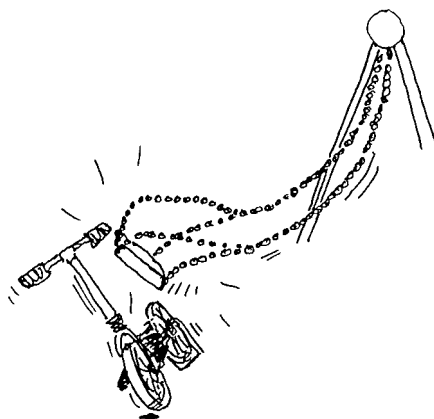


FIG. 1. Example of a picture used in Experiment 1. A swing hitting a scooter.

Materials

The experimental items consisted of 16 target pictures. Each picture was drawn in black ink on white paper and depicted a transitive action involving two inanimate entities (an agent whose movement appeared to cause the depicted action, and a patient, the recipient of the action). Half of the pictures had the agent on the left of the page and half on the right. Figure 1 shows an example picture.

Each picture was paired with two versions of a tape-recorded short story. The short stories mentioned both of the entities depicted in the picture, but were constructed to make one of the entities depicted in the picture more salient. Each story ended with the open question *What happened?* For example, if the picture depicted the action shown in Fig. 1 where a swing hits a scooter, the story could make salient either the swing (the agent), as in (4), or the scooter (the patient), as in (5). The target picture was the same for the two stories.

(4) There was this old rusty swing standing in a playground near a scooter, swaying and creaking in the wind. What happened? (Agent-salient)

(5) There was this old red scooter standing in a playground near a swing, with rusty wheels and scratched paint. What happened? (Patient-salient)

The salient entity was always introduced first, was preceded by the existential structure *There was* and the demonstrative *this*, was always preceded by an adjective, and had multiple properties predicated of it. The nonsalient entity was always introduced second and did not have additional properties predicated of it. The stories did not use pronouns (including relative pronouns) to refer back to the salient entity, which could cause reactivation of the head noun (Corbett & Chang, 1983).

There were 24 filler items. The filler pictures depicted intransitive actions (e.g., a boy running, a tap dripping). One third of the filler stories were created using the same syntactic structure used for the target stories. The remaining two thirds used a simple active structure as in (6) instead of an existential structure in order to provide variety and prevent participants from falling into a pattern. (The target picture for example (6) was a volcano erupting.)

(6) A huge dormant volcano on a remote Japanese island was starting to show signs of activity, making rumbling noises and sending the inhabitants into panic. What happened?

Two stimulus lists were constructed. Each contained eight agent-salient stories and eight patient-salient stories, plus the 24 filler stories. Each version of each experimental story appeared in one of the lists. The order of experimental items and fillers was randomized, with the constraint that each target picture was separated by a minimum of one filler picture and a maximum of two filler pictures, starting and ending with two filler pictures. The same order was used for both lists. Each list was then tape-recorded. Half the participants were randomly allocated to one list and the other half to the other list.

Procedure

Participants were told they would listen to a series of short stories that ended with the question *What happened?* After each story they would be shown a picture. Their task was to answer the question *What happened?* by producing a sentence which described the picture. They were told to pay careful attention to the

stories because the stories and the pictures were related. Participants were told that their descriptions would later serve as input for other participants in a picture recognition task. Specific instructions for describing the pictures were kept to a minimum, except that participants were strongly encouraged to avoid the use of pronouns to refer to any of the entities depicted in the picture. Four practice trials were used to illustrate the procedure and to ensure that the participants understood the instructions. Two of these trials depicted a transitive action and two depicted an intransitive action. Each participant was run individually. At the beginning of the session, the participant was given a folder containing the test pictures. Each story was presented aurally. When the participant heard the words *What happened?* at the end of each story, s/he turned over the next page in the folder and described the picture. Participants' responses were recorded on audio tapes. The tapes were transcribed to obtain a written record of the descriptions of the target pictures.

Scoring

The transcribed descriptions were scored as Active, Passive, or Other. Only those descriptions that observed the following criteria were considered valid Active and Passive responses: (a) Descriptions had to mention both of the target entities for that trial. This excluded descriptions mentioning only one entity (e.g., *The vase of flowers got broken*); (b) Descriptions had to contain a verb which could occur in an alternative syntactic structure, so that the message could be realized in an alternative syntactic form. For English, only transitive verbs permitting passivization (e.g., *hit*, *squash*) were allowed; verbs that could not be passivized (e.g., *land on*) were excluded. For Spanish we considered both passivizable verbs and nonpassivizable verbs because both types allow at least two alternative syntactic structures: Canonical Active and Dislocated Active. (c) To be scored as an Active, the agent of the action had to be the inanimate entity (this excluded descriptions like *Someone threw the tennis racket at the vase of flowers*); (d) To be scored as a Canonical

TABLE 1

Total Number of Responses in Each Experiment and Condition by Scoring Category

	Agent-salient				Patient-salient			
	Active	Passive	Dislocation	Other	Active	Passive	Dislocation	Other
English,	101	11	N/A	48	82	31	N/A	47
Experiment 1	(90.2%)	(9.8%)			(72.6%)	(27.4%)		
Spanish,	130	1	0	29	94	12	7	47
Experiment 1	(99.3%)	(0.7%)	(0%)		(83.2%)	(10.6%)	(6.2%)	
English,	95	28	N/A	37	40	66	N/A	54
Experiment 2	(77.2%)	(22.8%)			(37.7%)	(62.3%)		
Spanish,	117	4	2	37	60	26	27	47
Experiment 2	(95.1%)	(3.3%)	(1.6%)		(53.1%)	(23%)	(23.9%)	

Note. The figures in parentheses represent each type of response as a percentage of all active/passive responses in that condition.

Active, the subject had to appear in preverbal position and the object in postverbal position, yielding SVO order; (e) To be scored as a *Dislocated Active*, the subject had to appear in postverbal position and the object in preverbal position, yielding OVS order; (f) To be scored as a *Passive*, the patient had to appear in subject position and the agent as the *by*-object. This excluded descriptions where the inanimate agent had an instrumental function (e.g., *The tin was hit with the ball*); (g) Only the first full sentence produced on a trial was scored. This excluded descriptions involving coordination (e.g., *A train came along and ran over the broom*); (h) Descriptions had to contain a verb expressing the action carried out by the inanimate agent. This excluded descriptions like *The ship was under the wave*. All descriptions not meeting these criteria were scored as *Other*.

Results

Application of the scoring criteria yielded a total of 225 Active/Passive responses for the English participants (70.5% of all responses) and 244 Active/Noncanonical responses for the Spanish participants (76.5% of all responses). Table 1 shows the number of canonical responses (Canonical Active), noncanonical responses (Passives for both languages, and additionally Dislocated Actives for Spanish), and Other responses produced in each condition.

We performed analyses of variance (ANOVAs) to examine the effects of discourse salience upon the production of different syntactic structures in each language. For each condition, we calculated the mean proportion of each response type (Canonical Active, Passive, and Dislocated Active for Spanish) as a proportion of all Active/Passive responses in that condition for each participant or each item. These formed the basis for our analyses. Since the results for Canonical Active responses were complementary to those for noncanonical responses, only the analyses for noncanonical responses are reported. In all of the analyses to be reported the alpha level was set at .05, and only probabilities that exceed this are explicitly noted. Participants and items analyses were designated as F_1 and F_2 respectively.

Two-way ANOVAs performed on the mean percentages of noncanonical responses treating Language (English vs Spanish) as a between-participants and within-items factor and Salience (Agent-salient vs Patient-Salient) as a within-participants and within-items factor revealed main effects of Language (significant by participants $F_1(1,38) = 4.48$, and marginally significant by items $F_2(1,15) = 3.28$, $p < .09$) and Salience ($F_1(1,38) = 25.06$; $F_2(1,15) = 20.20$). Table 1 shows that there were more noncanonical responses in English than in Spanish and more noncanonical responses in

the patient-salient condition than in the agent-salient condition. There was no interaction between Language and Salience (both $F_s < 1$), suggesting that the influence of salience upon the production of noncanonical responses did not differ between languages.

Additional two-way ANOVAs examining the effects of Salience (Agent-salient vs Patient-salient) and Response Type (Passives vs Dislocations) in Spanish revealed a main effect of Salience ($F_1(1,19) = 19.80$; $F_2(1,15) = 13.65$). Table 1 shows that both Passives and Dislocations were produced more frequently when the patient was salient than when the agent was salient. No other effects approached significance (all $F_s < 2$).

t-Tests comparing Other responses in each Salience condition showed no difference for English (both $t_s < 1$) but a significant difference for Spanish ($t_1(19) = 2.34$; $t_2(15) = 1.98$). Table 1 shows that there were more excluded responses in Spanish when the patient was salient than when the agent was salient. Inspection of the Other responses did not reveal any consistent pattern to explain these differences.

Discussion

The results of Experiment 1 demonstrate a cross-linguistic influence of discourse salience upon syntactic processing in production. In both English and Spanish, when participants had a choice of structures available, they tended to produce structures that allowed an entity made more salient in previous context to appear in a syntactically more prominent position than a less salient entity. In both languages, this manifested itself as a tendency to produce more canonical active descriptions when the agent was salient than when the patient was salient and more passive descriptions when the patient was salient than when the agent was salient. Additionally, Spanish participants produced more dislocated active descriptions when the patient was salient. The results suggest that speakers' syntactic decisions are influenced by the salience of information in the preceding linguistic context. Note that we can exclude a purely lexical explanation of these effects: The

prior context introduced both of the relevant entities, and indeed the less salient entity had a recency advantage.

These results extend previous findings of context effects in production in two ways. First, they demonstrate that linguistic context exerts a cross-linguistic influence on syntactic processing and that it does so in qualitatively comparable ways: In both languages, speakers exploited the available syntactic alternatives to allow the salient entity to appear first. In particular, the tendency for Spanish speakers to produce dislocated active descriptions following patient-salient stories suggest that conceptual accessibility may be associated with variations in word order and not simply grammatical function assignment. Second, the results suggest that contextual effects in production cannot be reduced simply to a distinction between information that has been previously encountered (Given information) and information that has not been previously encountered (New information). Instead, speakers appear to be sensitive to the *relative* salience of information.

EXPERIMENT 2

The pattern of results found in Experiment 1 is compatible with the hypothesis that syntactic processing is affected by the relative ease of information retrieval. Variations in discourse salience (and hence in derived accessibility) were associated with the production of structures allowing more accessible information to appear earlier. This pattern converges with previous findings that inherently accessible entities, such as animate entities, tend to claim syntactically prominent positions (e.g., McDonald, Bock, & Kelly, 1993; Osgood, 1971; Osgood and Bock, 1977; Prat-Sala, 1997).

Experiment 2 examined how inherent and derived accessibility interact. We have proposed that an entity's overall conceptual accessibility in a particular context comprises its inherent accessibility plus any derived accessibility linked to that context. In Experiment 1, both entities were of comparable inherent accessibility. Hence any difference in overall conceptual accessibility sprang solely from differ-

ences in derived accessibility. In Experiment 2, we used stories that introduced one inherently accessible entity (an animate entity), which was always the patient, and one inherently less accessible entity (an inanimate entity), which was always the agent.

Experiment 2 thus addressed two questions. First, we examined the relative strength of linguistic context, and in particular discourse salience, as a determinant of syntactic structure. Sridhar (1988) found that Givenness in nonlinguistic context is a relatively weak influence on syntactic structure; its effects were far outweighed by those of animacy. If salience within the linguistic context exerts a comparably weak influence, the strong tendency found in Experiment 1 for salient entities to claim syntactic prominence might be overridden by an overall preference to assign prominence to inherently accessible animate entities. Alternatively, discourse salience might be sufficiently strong to override the influence of animacy. Second, we investigated whether derived accessibility is additive to inherent accessibility. If so, the tendency for speakers to place salient patients in prominent positions should be stronger in Experiment 2, where discourse salience simply added to the patient's inherent advantage over the agent, than in Experiment 1, where patient and agent were of comparable inherent accessibility and differed only in derived accessibility. Thus we predicted that the magnitude of the effects in the patient-salient condition should be greater than in Experiment 1.

Participants

Twenty students from the University of Edinburgh were paid to participate in the English conditions and 20 students from the University of Barcelona participated in the Spanish conditions in exchange for course credits. All were native speakers of their respective language.

Materials, Procedure, and Scoring

The materials consisted of 16 test pictures, each paired with two versions of a short story. The pictures were identical to those in Experiment 1, except that the inanimate patient in each



FIG. 2. Example of a picture used in Experiment 2. A swing hitting a man.

picture was replaced with an animate patient. An example is given in Fig. 2.

The short stories were constructed in the same way as those in Experiment 1, such that either the inanimate agent or the animate patient was made salient. For example, if the picture depicted the action shown in Fig. 2 (a swing hitting a man), the story would make either the agent salient, as in (7), or the patient salient, as in (8). However, the target picture was the same for both stories.

(7) There was this old rusty swing standing in a playground near a man, swaying and creaking in the wind. What happened? (Agent-salient)

(8) There was this little old man standing in a playground near a swing, going for a walk after a very tiring day at work. What happened? (Patient-salient)

The experimental procedure and scoring were the same as in Experiment 1.

Results

Application of the scoring criteria yielded a total of 229 (71.5%) Active/Passive English responses and 236 (74%) Active/Noncanonical Spanish responses.² Table 1 shows the number

² The 229 English responses included 13 responses where one entity was referred to using a pronoun (1 active response in the agent-salient condition and 11 actives and 1

of canonical responses (Canonical Actives), noncanonical responses (Passives for both language, and additionally Dislocated Actives for Spanish), and Other responses produced in each condition.

As before, we report analyses for the noncanonical responses only. We carried out two-way ANOVAs comparing the mean proportions of noncanonical responses, treating Language (English vs Spanish) as a between-participants and within-items factor and Salience (Agent-salient vs Patient-salient) as a within-participants and within-items factor. The results revealed a main effect of Language ($F_1(1,38) = 4.64$; $F_2(1,15) = 16.30$) and Salience ($F_1(1,38) = 57.70$; $F_2(1,15) = 55.46$). Table 1 shows that there were more noncanonical responses in English than in Spanish and more noncanonical responses in the Patient-Salient condition than in the Agent-Salient condition. There was no interaction between Language and Salience (both $F_s < 1$).

Further two-way ANOVAs examined the effects of Salience (Agent-salient vs Patient Salient) and Response Type (Passives vs Dislocations) in Spanish. These analyses revealed a main effect of Salience ($F_1(1,19) = 32.83$; $F_2(1,15) = 59.00$). Table 1 shows that both Passives and Dislocations were produced more frequently when the patient was salient than when the agent was salient. No other effects approached significance (all $F_s < 1$).

t-Tests comparing Other responses in each Salience condition showed no differences for either language (all $t_s < 1$).

Discussion

Experiment 2 provides further evidence that discourse salience affects syntax in production. Moreover, it shows that discourse salience ex-

erts a relatively strong influence on syntactic structure generation and can override the strong effect of animacy on syntactic structure found in previous work (e.g., Ferreira, 1994; McDonald, Bock, & Kelly, 1993; Osgood, 1971; Osgood and Bock, 1977; Prat-Sala, 1997): When the inanimate agent was made salient, participants in both languages tended to produce Active descriptions. Thus our results suggest that although animacy may be a strong determinant of syntactic structure in the absence of discourse context, discourse salience may largely override animacy effects within a discourse context. This contrasts with Sridhar's (1988) finding for Givenness in nonlinguistic context.

To investigate whether derived accessibility is additive to inherent accessibility we carried out a further set of analyses comparing the effects of discourse salience between Experiments 1 and 2. We performed 3-way ANOVAs on the proportions of noncanonical responses, with Experiment (Experiment 1 vs Experiment 2) and Language (English vs Spanish) as between-participants and between-items factor and Salience (Patient-Salient vs Agent-Salient) as a within-participants and within-items factor. The results show main effects of Experiment ($F_1(1,76) = 33.85$; $F_2(1,30) = 22.37$), Language ($F_1(1,76) = 11.60$; $F_2(1,30) = 17.14$), and Salience ($F_1(1,76) = 90.20$; $F_2(1,30) = 75.47$). There was also an interaction between Experiment and Salience ($F_1(1,76) = 15.46$; $F_2(1,30) = 13.40$). This interaction was investigated further using LSD tests which compared performance across the two experiments for each level of the Salience factor. These showed that when the patient was made salient, there were more noncanonical responses in Experiment 2 than in Experiment 1; however, when the agent was made salient, there was only a marginal difference in the proportion of noncanonical responses between Experiment 1 and Experiment 2 ($p < .07$). Remaining effects were not significant.

Further three-way ANOVAs examining the effects of Experiment (Experiment 1 vs Experiment 2), Salience (Agent-salient vs Patient Salient) and Response Type (Passives vs Dislocations) in Spanish revealed main effects of

passive in the patient-salient condition). The 236 Spanish responses included 27 responses where one entity was referred to using a pronoun (5 active responses in the agent-salient condition and 17 actives and 5 dislocated actives in the patient-salient condition). We report analyses for the data including pronominal responses; analyses performed on the data excluding pronominal responses produced the same pattern of results.

Experiment ($F_1(1,38) = 14.37$; $F_2(1,30) = 14.27$) and Saliency ($F_1(1,38) = 50.94$; $F_2(1,30) = 67.11$). There was also an interaction between Experiment and Saliency ($F_1(1,38) = 9.19$; $F_2(1,30) = 10.72$). The results of a LSD test on this interaction showed that when the patient was salient, there were more Passives/Dislocations in Experiment 2 than in Experiment 1; however, when the agent was made salient, there was no difference in the proportion of Passives/Dislocations between Experiment 1 and Experiment 2 ($p > .1$). Remaining effects were not significant.

Thus, speakers produced more noncanonical descriptions when the patient was animate than when it was inanimate. This is consistent with the hypothesis that an entity's derived accessibility is additive to its inherent accessibility. Could these effects be explained by differences in lexical accessibility between the animate and inanimate patients? In particular, can they be explained by differences in the frequency of the patient words in the two experiments? Although the agent and patient words did not differ in frequency in Experiment 1 (English: $t(15) < .5$; Spanish: $t(15) < 1.1$), the patient words in Experiment 2 were significantly more frequent than the agent words (English: $t(15) = 2.58$; Spanish: $t(15) = 3.96$) (Alameda & Cuetos, 1995; Baayen, Piepenbronck, & Gulliver, 1995). Jescheniak and Levelt (1994) showed that lexical frequency affects the ease with which a wordform is retrieved. Hence it is possible that the differences between Experiments 1 and 2 arise from variations in lexical accessibility and not conceptual accessibility as we have claimed.

We believe that such an explanation of our results is unlikely, however. First, such an explanation would be incompatible with many models of production (e.g., De Smedt, 1990, 1994; Kempen & Hoenkamp, 1987; Levelt, 1989) which propose that syntactic structure is determined before lexical (wordform) retrieval. Such models preclude an explanation based on lexical accessibility. One current model of production does allow a role for lexical accessibility in determining syntactic structure: Bock (1987) proposed that lexical accessibility influ-

ences word order. But in her model, this influence occurs only after grammatical functions have been assigned in accordance with conceptual accessibility. Hence lexical accessibility can influence the choice between a Canonical Active and a Dislocated Active (a purely word order decision), but cannot influence the choice between an Active and a Passive (a grammatical function decision). Thus, under even this model, the difference in the proportions of passive descriptions between Experiments 1 and 2 cannot be explained as a lexical accessibility effect; at most, the difference in dislocated active descriptions might be explained in this way. Even this seems unlikely, however. Existing evidence that variations in lexical accessibility impact upon the realization of syntactic structure, whether with respect to grammatical functions or word order, is very weak (see Levelt, 1989, for extensive discussion). Most compellingly, McDonald, Bock, and Kelly (1993) found no reliable influence of lexical accessibility on word order in a series of experiments that explicitly examined this issue. We therefore conclude that the differences found between Experiments 1 and 2 in the production of passives, and most probably also dislocated actives, cannot be explained by differences in lexical frequency.

GENERAL DISCUSSION

Taken together, our experiments demonstrate clearly a cross-linguistic influence of discourse saliency on syntactic processing in production. In both English and Spanish, participants tended to produce picture descriptions that allowed a more salient entity to appear in a more prominent syntactic position than another entity that had also been previously introduced, but that was less salient. This manifested itself in both languages as a tendency to produce more canonical active descriptions when the agent was made salient and more passive descriptions when the patient was made salient. In addition, Spanish speakers produced more dislocated active descriptions after patient-salient contexts. This overall tendency was mediated by inherent characteristics of the entities involved: Speakers produced more noncanonical structures when

the patient was not only salient within the linguistic context, but also animate, than when the patient was salient but inanimate.

Our results extend previous findings. They demonstrate that, like nonlinguistic context, linguistic context exerts a cross-linguistic influence on syntactic processing in production; they also exclude a lexical priming account of these effects. At one level, our experiments show a common pattern: Salient entities tended to precede less salient entities in both languages. However, they also show cross-linguistic differences in the precise syntactic manifestation of salience. They suggest that the way in which salience (and by extension, conceptual accessibility) influences syntactic processing in any particular language is constrained by the syntactic options available within that language. Thus, in English and Spanish it affects which entity appeared as the sentence-initial subject in active and passive structures, but Spanish speakers additionally exploited an alternative syntactic option, the dislocated active structure, to place the salient entity sentence-initially. Overall, the pattern of results is compatible with the hypothesis that language production is incremental and specifically that speakers exploit the available syntactic options to produce more easily retrieved information before less easily retrieved information.

Our results also clarify the relationship between inherent accessibility and derived accessibility. They demonstrate that derived accessibility can independently induce syntactic structure variation, and in particular the production of normally disfavored (marked) structures, such as passives (e.g., Quirk, Greenbaum, Leech, & Svartvik, 1985), when entities are matched for inherent accessibility. However, our results support the hypothesis that the overall accessibility of an entity, and hence its overall likelihood of claiming a prominent syntactic position, is determined by the combination of its inherent and derived accessibility. Thus, context can make an inherently accessible entity still more accessible; but given a sufficiently strong context, an inherently inaccessible entity may be temporarily more accessible than an

inherently accessible entity, as we found for agent-salient contexts in Experiment 2.

Our contexts were extremely strong, employing multiple linguistic manipulations to increase salience. We cannot be sure that all contexts would be strong enough to override inherent accessibility effects, and the difference between the strength of our linguistic context effects and Sridhar's (1988) nonlinguistic context effects may reflect differences in the contextual manipulations employed. In fact, we suggest that the derived accessibility of an entity can vary infinitely. It will depend on the precise features of the context in which it appears. Put simply, we predict that the more numerous and the stronger the manipulations employed in a context, the greater the derived accessibility (subject to ceiling effects) and hence the stronger the associated syntactic effects. Thus other manipulations, such as the use of proper names (Sanford, Moar, & Garrod, 1988), would induce the same overall pattern of results, but the magnitude of the effects might vary.

Speakers of both languages produced more active descriptions overall than noncanonical descriptions. We assume that during syntactic processing, alternative syntactic structures compete (cf. Bock, 1987). Syntactic processing is thus affected not only by conceptual accessibility but also by the strength of the alternative structures. Overall, canonical structures tend to be more highly activated than noncanonical structures, though the precise degree of activation varies and may be affected by, for example, previous linguistic context (Bock, 1986b; Bock & Loebell, 1990; Hartsuiker & Kolk, 1998; Pickering & Branigan, 1998). Salience manipulations may act to increase the likelihood of producing noncanonical structures, but do not necessarily override the preference for canonical structures. Our findings that languages differ in this respect, such that English speakers are more likely than Spanish speakers to produce noncanonical structures, suggest further that activation levels vary not only between structures, but also between languages. For example, passive structures seem to be more highly activated in English than in Spanish (see Bock (1986b) and Hartsuiker and Kolk (1998) for evidence

suggesting a similar asymmetry between passives in English and Dutch; see also Sridhar, 1988). This approach is broadly compatible with Bates and MacWhinney's (1989) competition model, in which numerous factors whose relative strength varies between languages conspire to determine syntactic structure.

Our results are informative about the syntactic locus of conceptual accessibility effects in production, more specifically whether conceptual accessibility is reflected in grammatical function assignment only. In canonical active and passive descriptions, the more accessible entity was assigned both an early word order position and the highest grammatical function (subject). However, word order and grammatical function are not confounded in dislocated active structures. The tendency for Spanish speakers to produce dislocated active descriptions following patient-salient stories suggests that more accessible entities tend to appear in early word order positions, independent of grammatical function. We cannot be sure from our results whether conceptual accessibility also influences the assignment of grammatical functions, but our results argue against theories of production in which conceptual accessibility is associated primarily with grammatical function assignment (Bock, 1987); they support theories in which conceptual accessibility can influence word order (e.g., De Smedt, 1990, 1994; Kempen & Hoenkamp, 1987; Levelt, 1989).

Our results also suggest that the binary Given/New distinction made in previous work is too simple. Speakers are clearly sensitive not simply to whether an entity is Given or New within the current linguistic (and we assume also nonlinguistic) context, but to its relative salience in the context. Our findings therefore provide empirical evidence to support the detailed taxonomies of referential status that have been proposed in recent linguistic theories (e.g., Birner, 1994; Gundel, Hedberg, & Zacharski, 1993; Prince, 1981, 1992). These theories replace a binary Given/New distinction with finer-grained distinctions, such as "in focus" and "type identifiable" (Gundel, Hedberg, & Zacharski, 1993). Our findings supplement the existing evidence from comprehension that

such distinctions have a psychological basis (e.g., Clark & Haviland, 1977; Haviland & Clark, 1974; Sanford & Garrod, 1981) by demonstrating that these distinctions are also reflected in on-line cross-linguistic language production (see also Brennan, 1995). Our results also support the hypothesis of a relationship between referential status and word order, with more salient information preceding less salient information (e.g., Halliday, 1967; Sgall, Hajičová, & Panevova, 1986). Some linguists have suggested that Given/New ordering—and by extension, ordering in which discourse entities higher up in the referential status hierarchy precede those lower down the hierarchy—might be a language universal (Clark & Clark, 1978). Our finding of a consistent preference in both English and Spanish for more salient entities to precede less salient entities provides some empirical support for this proposal, although the question clearly requires evidence from a wider range of languages. Thus, our results suggest that at least some of the linguistic regularities noted by pragmatic theories may have a partial source in the psychological mechanisms underlying language production.

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(Received December 9, 1998)

(Revision received April 16, 1999)