Cross-event lexical features are accessed in verb lexicalization

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Languages vary in the components of spontaneous motion events they lexicalize in verbs. In English, motion verbs often encode *manner* ("*He **ran** into the house*") but in Spanish, they typically encode *path* ("*Él **entró** en la casa corriendo*") ([1]). These lexicalization biases affect how novel motion verbs are interpreted cross-linguistically ([2-6]) and can be adjusted based on input ([7, 8]). *Manner* and *path* are thus high-order motion features accessed during event comprehension ([6, 8]) but have remained singularities within studies of lexicalization and verb learning.

Here we ask whether the **manner-path** distinction in the spontaneous-motion domain is semantically similar to the **means-result** distinction in the caused-motion domain (e.g., in the event of a girl kicking a ball into a bucket, kicking is the means and the sending-into-a-bucket is the result). When speakers are taught lexicalization biases in the spontaneous-motion domain, do these new biases shape means-result verb interpretations in the caused-motion domain, and do so consistently across languages? According to the *domain-specific features hypothesis,* manner-path and means-result features are specific only to relevant subtypes of motion events (spontaneous and caused motion, respectively) and lexicalization biases in one domain would not shape biases in another domain. However, according to the *domain-general features hypothesis*, a single, general lexical feature (MANNER-RESULT) structures the motion lexicon and is accessible during verb acquisition, perhaps cross-linguistically ([6, 9, 10]). Therefore, lexicalization biases learned in one domain would affect biases in another domain.

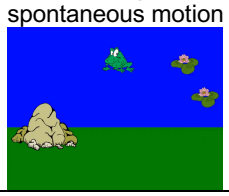
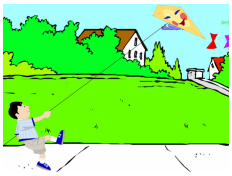
Participants Adult native speakers of English (N=78) and Spanish (N=76) were assigned one of the three training types: No-training, Manner-verb training, and Path-verb training.

Procedure The training groups were told that they will be learning an alien language. On each of the 8 training trials, they saw a videoclip depicting spontaneous-motion (e.g. a Fish flipping through a barrel; Table 1) and heard a novel verb in a sentence ('*This is gorping / Esto es dojar'*). Afterwards, they saw a same-manner and a same-path clip. Participants in the Manner-verb training condition were told that the same-manner clip, but not the same-path clip, is an instance of the verb, and vice versa for the Path-verb training condition. The No-training group omitted this phase. After training, participants were tested on four novel spontaneous-motion events and eight caused-motion events. On each trial, participants watched a clip along with a novel verb in a sentence. Afterwards, they saw a same-manner (or same-means, for caused-motion) clip, and a same-path (or same-result, for caused-motion) clip, and were asked whether they accept them as instances of the verb *('Was that bligging? / ¿Eso fue sarar?'*; Table 1).

Results-Discussion In the No-training group, Spanish-speaking participants revealed a stronger path-bias on both spontaneous and caused motion test trials ($p<.05$); On spontaneous-motion trials, both English- and Spanish-speaking participants trained with manner or path-verbs generalized these lexicalization patterns to new spontaneous motion events (*glmer*, p's<.05, Fig.1a, 1b). Importantly, in caused-motion trials, both English- and Spanish-speaking participants who learned manner or path-biases in the spontaneous motion domain (≥ 75% accuracy) transferred these lexicalization patterns to caused motion events (p's<.05, Fig. 2a, 2b). The overall data pattern supports the *domain-general features hypothesis*, indicating that there are underlying parallels between Manner/Path and Means/Result. Thus, higher-order generalizations operate over conceptual or lexical dimensions that are not specific to a particular kind of motion event (spontaneous motion or caused motion) – regardless of one's native language. Therefore, the notions of means/manner and result/path are not only part of descriptive typology, but are also features of our conceptualization of events, which are readily accessible to speakers of typologically different languages during language comprehension. (Languages: English, Spanish)

Table 1. Example of training and test trials. (The order of the means/manner and the path/result testing trials was counterbalanced across verbs.)

Phase	Video type	Scene	Language (English, Spanish)

Training 	Initial video		Fish flips through barrel	This is gorping. Esto es dojar.	
	Trial	Same **Manner**	Fish **flips** under barrel	**Manner-verb training**	This is gorping. Esto es dojar.
				Path-verb training	This not gorping. Esto no es dojar.
		Same **Path**	Fish bobs **through** barrel	**Manner-verb training**	This is not gorping. Esto no es dojar.
				Path-verb training	This is gorping. Esto es dojar.
Testing – spontaneous motion 	Initial video		Frog jumps to the front of a rock	This is bligging. Esto es sarar.	
	Trial	Same **Manner**	Frog **jumps** to the top of a rock	Was that bligging? (Y/N) ¿Eso fue sarar? (Y/N)	
		Same **Path**	Frog hops **to the front of a rock**	Was that bligging? (Y/N) ¿Eso fue sarar? (Y/N)	
Testing – caused motion 	Initial video		A boy pulls on a kite string; the kite comes down from the sky	This is nolding. Esto es chellar.	
	Trial	Same **Means**	A boy **pulls** on a kite string; the kite moves slightly in the air	Was that nolding? (Y/N) ¿Eso fue chellar? (Y/N)	
		Same **Result**	A boy clasps a kite string; the kite **comes down from the sky**	Was that nolding? (Y/N) ¿Eso fue chellar? (Y/N)	

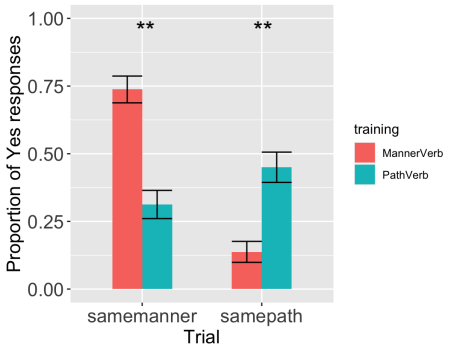


Figure 1a. English-speaking participants' responses on **spontaneous motion** test trials (error bars are ±SE)

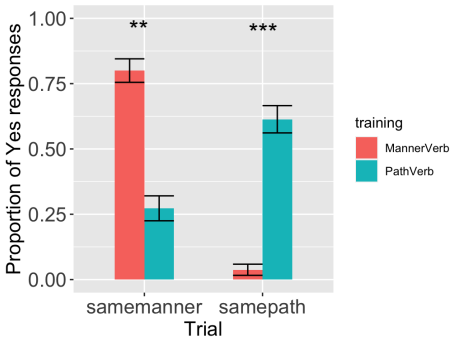


Figure 1b. Spanish-speaking participants' responses on **spontaneous motion** test trials (error bars are ±SE)

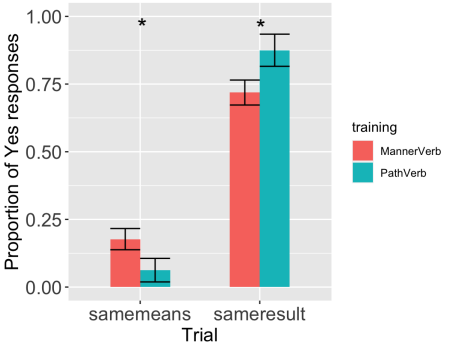


Figure 2a. English-speaking participants' responses on **caused motion** test trials (error bars are ±SE) (Participants who successfully learned intended biases for spontaneous motion)

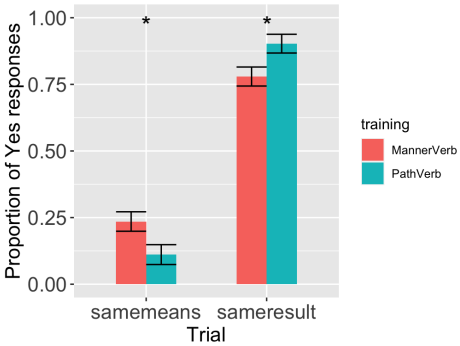


Figure 2b. Spanish-speaking participants' responses on **caused motion** test trials (error bars are ±SE) (Participants who successfully learned intended biases for spontaneous motion)

References

[1] Talmy 1985. In *Language typology and syntactic description.* **[2]** Hohenstein 2005. *Journal of Cognition and Development*. **[3]** Naigles & Terrazas 1998. *Psych. Sci*. **[4]** Maguire et al. 2010. *Cognition*. **[5]** Papafragou, Massey & Gleitman 2002. *Cognition.* **[6]** Papafragou & Selimis 2010. *Lang. Learning & Dev*. **[7]** Shafto, Havasi, & Snedeker 2013. *Dev.Psych*. **[8]** Geojo 2015. Harvard Dissertation. **[9]** Rappaport Hovav & Levin 1988. Building verb meanings. **[10]** Beavers 2010. On affectedness. *NLLT.*