Cross-domain event primitives are reflected in motion verb learning across languages

Languages vary in the components of a motion event they prefer to lexicalize in verbs. English often packages the manner in the verb ("He **ran** into the store"). Spanish typically encodes path in the verb ("Él **entró** en la tienda corriendo") ([1]). These verb lexicalization biases affect the way novel motion verbs are acquired cross-linguistically ([2]-[6]) but are malleable ([7], [8]). The **manner-path** distinction in the spontaneous-motion domain is semantically similar to the **means-result** distinction in the caused-motion domain ([6]), for example a girl kicking a ball into a bucket, where kicking is the means and the sending-into-a-bucket is the result. We test whether taught lexicalization biases in spontaneous-motion shape means-result verb learning in the caused-motion domain, and do so consistently across languages. If so, this would give evidence for both the structure of the lexicon ([9]), and the flexibility of verb lexicalization biases.

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.

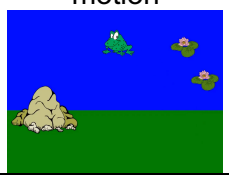
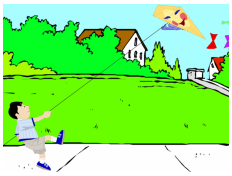
Training The training groups were told that they will be learning an alien language. They were trained on eight novel verbs each associated with a videoclip depicting spontaneous-motion. On each trial, participants first saw a clip with a novel verb. Afterwards, they saw a manner-match clip and a path-match clip. Participants in the Manner-verb training condition were told that the manner-match clip, but not the path-match clip, is an instance of the verb, and vice versa for the Path-verb training condition. (Table1)

Testing 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. Afterwards, they saw a manner-match (or means-match, for caused-motion) clip, and a path-match (or result-match, for caused-motion) clip, and were asked whether they accept them as instances of the verb (Table1).

Results/Discussion 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<0.05). This suggests that learned lexicalization patterns affect novel spontaneous-motion verb conjectures. On 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 new caused motion events (p's<0.05). After learning novel motion verbs that encoded manner or path, both English- and Spanish-speaking adults formed corresponding lexicalization biases that influenced the acquisition of subsequently encountered motion verbs across domains. The overall data pattern indicates that there are underlying commonalities between Manner/Path and Means/Result, suggesting that higher-order generalizations operate over conceptual or lexical dimensions that are not specific to a particular kind of event (spontaneous motion or caused motion).

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

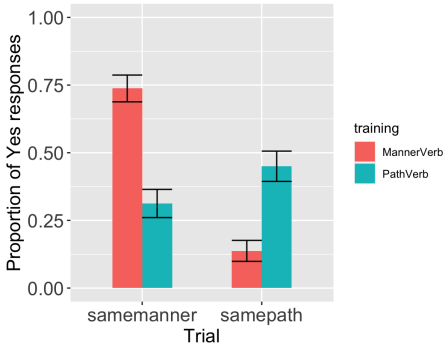


Figure 1. English-speaking participants' responses on **spontaneous motion** test trials (error bars are ±SE)

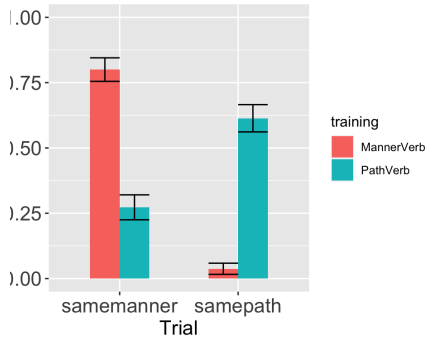


Figure 2. Spanish-speaking participants' responses on **spontaneous motion** test trials (error bars are ±SE)

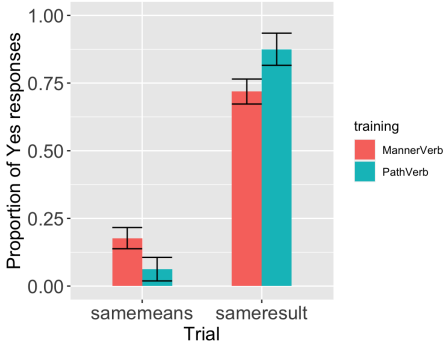


Figure 3. English-speaking participants' responses on **caused motion** test trials (error bars are ±SE) (Participants who successfully learned intended biases for spontaneous motion; ≥ 75% accuracy)

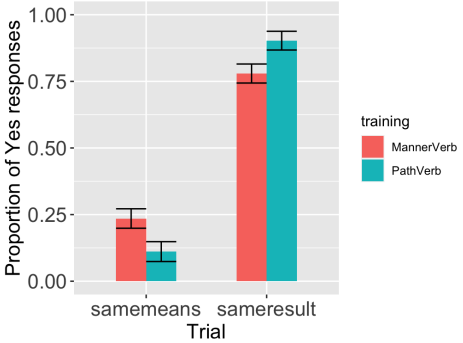


Figure 4. Spanish-speaking participants' responses on **caused motion** test trials (error bars are ±SE) (Participants who successfully learned intended biases for spontaneous motion; ≥ 75% accuracy)

References

[1] Talmy (1985). In *Language typology and syntactic description.* **[2]** Hohenstein (2005). *Journal of Cognition and Development*. **[3]** Naigles & Terrazas (1998). *Psychological Science*. **[4]** Maguire et al. (2010). *Cognition*. **[5]** Papafragou, Massey & Gleitman. (2002). *Cognition.* **[6]** Papafragou & Selimis (2010). *Language Learning and Development*. **[7]** Shafto, Havasi, & Snedeker (2013). *Developmental Psychology*. **[8]** Geojo (2015). Harvard Dissertation. **[9]** Rappaport Hovav & Levin. 1988. Building verb meanings.