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Unlearning the boundary-crossing constraint: Processing Instruction and the acquisition of motion event construal

Jacqueline Laws, Anthony Attwood and Jeanine Treffers-Daller

Abstract

This study explores the effects of instruction on the acquisition of motion event construal among learners of English as a second language. The challenge for learners with Verb-framed first languages is that they need to 'unlearn' the boundary-crossing constraint and conflate manner and motion in the main verb, as in *she ran into the bank*, however, there is little research on how this domain can be taught. We evaluate performance on story-telling productive tasks using three experimental treatments involving 1) an input-only approach based on the principles of Processing Instruction, 2) combined input and output training and 3) explicit information only about the target construction. The findings show that boundary-crossing constructions expressing manner can be taught and learning effects generalised to non-boundary-crossing structures not included in the training material. The effectiveness of input-only instruction persists over a two-week period, and compares positively with that of an input+output teaching package.

Keywords: Input processing, motion event construal, boundary crossing, instructed SLA, transfer

1 Introduction

The challenges for second language (L2) learners to acquire target-like ways to talk about motion through space in their L2 are well-documented (e.g., Cadierno 2004; Cadierno and Lund 2004; Cadierno and Ruiz 2006; Antonijevic and Berthaud 2009; Attwood 2014; Treffers-Daller and Tidball 2016). These difficulties may arise because languages differ in the ways in which they express motion. As shown by Slobin (2003), some languages (e.g. Romance) are predominantly verb-framed (V-framed) in that verbs such as *enter* are used to express path of motion, while manner is expressed in an alternative structure outside the main verb, for instance an adverbial expression, as in the French example *il est entré dans la banque en courant* 'he entered the bank running'. This pattern is much less widespread in English or German, which are largely satellite-framed (S-framed) in that prepositions or

particles such as *into* are used to express path of motion, and manner of motion (e.g., *run*) is conflated in the main verb (Talmy 1985), as in *he ran into the bank* (Engemann, Hendriks, Hickmann, Soroli and Vincent 2015; Hendriks and Hickmann 2015; Larrañaga, Treffers-Daller and Tidball 2012). In languages such as Chinese and Thai, a third language type, equipollently-framed (E-framed, Slobin 2004), is found consisting of serial verb patterns where manner and deictic path are both encoded as main verbs, e.g., *zǒu lái* 'walk come' (Chen and Guo 2009; Wu 2011). However, as noted by Beavers, Levin and Tham (2010), many languages allow for different patterns, and classifying languages into these three types can be an oversimplification.

Slobin (2003) suggested that, from an early age, a person is trained to attend to elements of a motion event which can be easily encoded within the grammatical parameters of their first language (L1). Making the switch from L1 motion event patterns to a typologically different pattern has been shown to be extremely difficult for L2 learners. L2 learners struggle in particular with events that involve crossing a spatial boundary (see Section 2.1). Bilinguals whose L1 is V-framed underuse such structures compared with monolinguals of the target language, even after many years of exposure to S-framed patterns (Daller, Treffers-Daller and Furman 2011). This illustrates Slobin's (1996: 89) stipulation that the training children receive in the formulation of motion events is "exceptionally resistant to restructuring in adult second-language acquisition". It is therefore likely that the patterns learnt in early childhood are transferred to a second language.

Despite the evident challenges for learners, this area has been relatively neglected in language teaching (Cadierno 2008). One of the few available studies (Cadierno and Robinson 2009) shows that this domain is teachable, although the structures needed to talk about motion are generally not highlighted in grammar classes, and therefore L2 students of English do not receive explicit instruction (including negative feedback) about the acceptability of different patterns. In addition, classroom learners receive limited exposure to the target form; therefore, they do not receive enough positive evidence regarding the patterns that are most widely used either (Treffers-Daller and Tidball 2016). From the teaching viewpoint, instructors may be unaware of the complexities of the motion domain and, as a result, when designing syllabi, may give little or no attention to the topic (Attwood 2014).

One pedagogical approach that has been shown to be successful in facilitating the acquisition of L2 target structures that are different from those in language learners' L1 is Processing Instruction (PI), which is based on a theory of learning called Input Processing (IP) proposed by VanPatten and Cadierno (1993). Although the vast majority of research into

instructed SLA research is not based on a theory of learning (VanPatten, 2015), we take the view that it is crucially important for teaching interventions to be informed by a theory of learning. Input processing was adopted as the theoretical framework for the current study, because it focuses on steering learners away from less-than-optimal default strategies towards new form-meaning mappings. If L2 learners of English are to be successful in learning how to express motion in the target language, they can no longer rely on L1-based strategies, such as "map path onto the main verb". The current paper sets out to investigate to what extent an IP-informed intervention will enable learners to reset the ways in which they map meaning onto form in motion expressions. This study is novel compared with others that evaluate the effectiveness of PI because we extend the domain of investigation from morphosyntax to lexicogrammar (Halliday 1961), in that we focus on the lexicogrammatical patterns involved in the construal of motion events. We believe that testing a theory in new domains is important because a theory which can be shown to make correct predictions in new domains has more value than one which is only valid for a limited range of domains.

The research reported here aimed to identify an effective pedagogical approach to assist instructors in the teaching of motion events in English, with a specific focus on offering training in overcoming L2 learners' tendency to map path onto the main verb, and unlearning the boundary-crossing constraint. Since the acquisition of this structure requires learners of English with V-framed L1s to unlearn L1 patterns, this group constituted the principal learner population but, in order to draw comparisons with other L1 typologies, participants with S-framed and E-framed L1s were also included in the study. To this end, a narrative elicitation task was used to evaluate the relative effectiveness of two instructional packages, one based purely on input-oriented activities, in accordance with the principles of Processing Instruction (PI), and the other on a combination of input and output tasks, compared with a third group who received explicit information about the target construction but no structured activities.

2 Background

2.1 Cross-Linguistic Differences: The Boundary-Crossing Constraint

A key area of difficulty for L2 learners of English whose L1 is V-framed is the difference in the way the crossing of a spatial boundary is expressed (Aske 1989; Slobin and Hoiting 1994). The term "boundary crossing" refers to a specific situation type which involves overcoming a physical boundary that a moving Figure encounters (Filipovic 2007: 37), as in (1).

(1) *John went into the house*.

By contrast, a non-boundary-crossing situation does not involve such a boundary, e.g., the Figure moves along a path as in (2), or arrives at a particular point without traversing the physical boundary, as in (3).

(2) *John went along a road*.

(3) *John went to the shops*.

The forms represented in (1)-(3) are possible in S-framed and V-framed languages; however, the former language type also allows the conflation of manner in the main verb when a boundary crossing is involved, as in (4):

(4) *John ran into the house.*

In V-framed languages, the path component of a boundary-crossing event is predominantly encoded in the main verb and the manner component, if used, is encoded in an adverbial expression as in (5):

(5) *John entered the house running.*

This construction is illustrated for the V-framed language Arabic in (6):

(6) *daXala Adam i:la l-bait raki:Dan*
entered Adam to the house running
'Adam entered the house running.' (Alghamdi et al., 2019, p. 94)

However, some types of boundary-crossing events can be described in V-framed languages by encoding manner in the main verb. For example, in a free description task Özçalışkan (2015) demonstrates that Turkish L1 speakers commonly use manner verbs in their L1 to express instantaneous motion events, such as *dive into a pool* and *leap over a hurdle*, but they use exclusively path verbs when describing temporally extended motion types such as *run into the house* or *creep out of the house*. Therefore, although there are restricted cases where V-framed languages allow the encoding of manner in the main verb in boundary-crossing events, the predominant pattern is for path verbs to encode such motion types.

Larrañaga et al. (2012) found evidence of particular challenges for English learners of Spanish in the expression of boundary-crossing events. The study examined oral elicited narratives involving a bank robber produced by 68 L1 English students of L2 Spanish at three levels of proficiency. The experimental focus was a boundary-crossing event where *the robber runs into the bank*. The results showed that even level 3 students, who had spent six months in Spain, seemed to be unaware of the constraints on conflation patterns while describing a boundary-crossing event. Consequently, many of the descriptions provided appeared to be literal translations from L1 English, e.g. (7) and (8) seem to be modelled on

the English expression *run into the bank*. In Spanish, (7) can only be interpreted as *running inside a bank* (not *into* it), and (8) as *running up to the bank* (reaching the boundary) but not actually entering it.

(7) *corre* [motion + manner] *en un banco*
'(He/she) runs in a bank.'

(8) *está corriendo* [motion + manner] [*] *al banco*
'(He/she) is running to the bank.'

Learning the Spanish patterns is complex for learners with an S-framed L1 because there is no positive evidence in the input to help learners discover that the ungrammatical form (a manner verb with a directional PP) is impossible in the target language. Thus, learners fail to recover from a transfer-induced overgeneralisation. The authors conclude that if learners do not receive negative evidence about the unacceptability of (7-8), L1 transfer is likely to occur even at higher levels of proficiency.

In theory, learning the S-framed pattern should be easier for L2 learners, because there is positive evidence in the input (White 1991) that conflating manner in the main verb in boundary crossings is possible in their L2. In other words, they do not need to recover from overgeneralisation but instead need to discover that an L1 constraint on the use of manner verbs in these constructions does not apply in their L2. Although this issue has received less attention than the difficulties experienced by learners with an S-framed language trying to acquire the boundary-crossing constraint in V-framed languages (see Hendriks and Hickmann 2015), there is some evidence that L2 learners of English with a V-framed L1 find it difficult to unlearn the boundary-crossing constraint. Alghamdi, Daller and Milton (2019), for example, found that Arabic L1 learners of English underused manner verbs in boundary crossings and that the frequency with which manner verbs were used in these constructions could not be predicted from the frequency of these structures in the input, as measured against the British National Corpus. The authors therefore suggest that the patterns used in the English S-framed system are not readily discernible without some form of instruction which draws learners' attention to patterns that are (un)usual in a language.

In their study of the role of statistical learning in the acquisition of L2 motion event construal, Treffers-Daller and Calude (2015) found that the positive evidence available to L2 learners of French from the input was not enough for the learners to acquire the boundary-crossing constraint. The authors conclude that attention to the frequency of path and manner verb patterns was only partially successful in helping learners master these forms, with a noticeable failure as regards constructions which involved a boundary crossing. Therefore,

direct negative evidence may be required to learn the new patterns and to recover from transfer-induced overgeneralizations or undergeneralizations. As suggested in Cadierno (2008) and Treffers-Daller (2012), an intervention package based on the principles of Processing Instruction (VanPatten and Cadierno 1993) may do exactly that and help encourage learners to pay attention to the form of motion event construals whilst focusing on the meaning of these expressions. The next section summarizes the key aspects of this pedagogical approach and the learning theory which underpins it.

2.2 Input Processing (IP)

According to the IP model (VanPatten 2004), incoming linguistic data (input) is at first processed and converted to intake (Corder 1967), which can then be accommodated and incorporated into the developing system. In contrast to more traditional approaches that focus on form, VanPatten's model focuses on the mechanisms which promote form-meaning connections (FMCs) in the conversion of input to intake. However, learners often make use of incorrect default strategies, described by VanPatten (2004: 334) as the L1 transfer principle: Learners begin acquisition with L1 parsing procedures. While the idea that learners start from the L1 in learning L2 is certainly not new (Kellerman 1995), the novelty of IP resides in its emphasis on overcoming erroneous default strategies through specific input-oriented tasks rather than by focusing on output.

PI aims at enhancing learner intake extracted from the input through a series of structured input (SI) activities designed to guide learners away from default strategies (VanPatten 2004). Importantly, during the SI phase learners focus on input and are not required to produce the target structure prematurely. This focussed engagement does more than raise awareness, as learners are encouraged to make appropriate FMCs by prompting a disruption at the parsing stage which forces the learner to make a readjustment in how a sentence is decoded (VanPatten 2008: 54). Typical PI lessons follow three stages:

1. Explicit instruction (EI) where learners are provided with both explicit information about the target form and made aware of potential problems with default strategies.
2. Referential SI activities require right or wrong answers and learners are forced to process the target structure for the appropriate form-meaning connection.
3. Affective SI activities contain a large number of target structures. Rather than indicating whether these are right or wrong, learners provide opinions or beliefs about the real world through guided tasks.

This pedagogical approach is applicable to the teaching of motion events because it places emphasis on three areas particularly relevant to this domain. PI has previously been used to focus on areas of language which a) appear to be slow to emerge in production; b) differ from the learners' L1; c) are likely to be 'ignored' by learners when they normally hear or read the languages (Marsden 2006).

Since its inception, PI has been the subject of much debate, particularly regarding the relative effectiveness of EI and SI activities. VanPatten and Oikkenon (1996) compared relative effects of PI, SI and EI on interpretation and production tasks; they demonstrated that EI has a negligible effect on its own, whereas Fernández (2008) and Henry, Culman and VanPatten (2009) found that EI has differential effects on performance depending on the nature of the feature to be acquired. When comparing performance on a primary and secondary feature, White and DeMil (2013) found that EI appears not to affect performance at immediate post-test for either feature, but that in a delayed post-test performance was maintained for the primary but not the secondary target. Thus, discussion on the effect of EI is not resolved.

Following VanPatten and Cadierno (1993), research has been conducted to test the effectiveness of PI by comparing it with approaches containing meaningful output practice. For instance, Benati (2005) compared PI with traditional instruction (TI) and meaning-based output instruction (MOI) in the teaching of the simple past in English to Greek and Chinese children. The results showed PI was superior to MOI and TI in interpretation tasks and equal in production tasks. By contrast, in their study of the acquisition of direct object pronouns in Spanish by first semester college students, Morgan-Short and Bowden (2006) found no significant difference between MOI and PI in interpretation tasks. Furthermore, participants who had received MOI performed marginally better than their PI counterparts in production tasks. Conflicting findings emerge particularly when the effectiveness of PI is compared with instruction which includes output practice. VanPatten emphasizes the importance of allowing input to become intake and for this to have an effect on the learner's developing linguistic system before proceeding to output practice. This does not mean that PI practitioners are intent on banishing output from the classroom, but rather that output practice is seen as helping learners to improve in fluency and accuracy but not in developing the linguistic system.

According to DeKeyser and Prieto Botana (2014), the evidence to date shows that output-based interventions favour productive skills and input-based studies favour receptive skills. However, they point out that the relative contribution of input and output practice is far

from settled. One of the objectives of the research reported here is to contribute to our understanding of the respective effectiveness of input-based versus output-based approaches in L2 acquisition, by focusing on an area that has received minimal attention in second language acquisition (SLA), namely the teachability of motion event construal. Languages lexicalise motion differently and L2 learners and bilinguals are known to struggle with restructuring their grammars in this area. VanPatten's L1 principle is relevant for the current study in that it can help explain why L2 learners make errors in form-meaning mapping in this area: L2 learners of English with a V-framed L1 continue to map path onto the main verb, which is the usual way to express path in V-framed languages. In addition, they fail to conflate manner in the main verb in English boundary crossings, which is not allowed in their L1 but is very common in English. Our main aim is to address how learners can be encouraged to overcome their L1-based default strategies.

Studies on SLA have shown that instructional treatments can promote generalisation of linguistic rules to structures not explicitly provided in the primary material. For example, Robinson (1996) tested 104 Korean learners of English to compare the transfer effects of 'easy' and 'hard' grammar rules as a function of four training regimes: implicit, incidental, rule-search and instructed conditions. He found that although performance on a grammaticality judgement task was overall superior for the instructed group on the easy rule set, the implicit learning group outperformed all other groups with respect to the identification of hard rules, as measured by chance and above-chance performance. This finding suggests that rule learning which took place during the training phase was utilised on novel stimulus material presented during the transfer phase. Therefore, in addition to the main aim of the current study relating to the unlearning of the boundary-crossing constraint, as in *he walked into the shop,* we also explore the extent to which learners transfer their newly acquired knowledge of the target form to constructions involving manner verbs with no boundary crossing, as in *he walked towards the shop,* a structure which occurs less frequently in V-framed languages (see Muñoz and Cadierno 2019 for data on L1 monolingual Spanish speakers and Özçalışkan and Slobin, (2003) for a comparison between English and Turkish).

To the best of our knowledge, there is currently only one other study on SLA in which the principles of PI are used to focus on the teaching of motion event construal: Colasacco (2019) compared the effect of PI containing a Cognitive Grammar component with Traditional Instruction techniques and a control group on the acquisition of Spanish deictic path verbs (*come, go, take* and *bring*) by German and Italian learners. By contrast, the research reported here aimed to identify an effective pedagogical approach to assist

instructors in the teaching of motion events in English, in particular those involving boundary-crossing.

3 The Present Study

The aims of this study are three-fold: 1) to compare the relative effectiveness of input-based and input+output-based instruction on the production of L2 English motion expressions involving manner and a boundary crossing, such as *he walked into the shop,* compared with a group who only received information on the target structure; 2) to determine whether the three experimental groups of participants apply recently-acquired knowledge about the conflation of manner in the main verb in English to motion events not involving a boundary crossing, such as *he walked towards the shop,* which had not been included in instructional materials; and 3) to assess learning performance as a function of participant L1, with particular focus on participants whose L1 is V-framed.

The third experimental group only received the Explicit Instruction (EI) component of the first two experimental treatments. Several studies have shown that a no-instruction control condition produces no gains in performance between pre- and post-tests (e.g., Colasacco 2019; Marsden and Chen 2011). As discussed in section 2.2, the effectiveness of EI is dependent on a number of factors. As we are mainly interested in the effect of SI on the acquisition of motion event construal in L2 English, we needed to ascertain that any performance gains among L2 learners were not due to the EI phase. To be able to disentangle the effects of SI and EI, the third experimental group only received EI, but not the intervention with SI.

The effects of the three experimental treatments were evaluated using productive tasks involving the elicitation of written narratives from cartoon sequences. The study focuses particularly on boundary-crossing expressions for *entering* and *exiting*, which use intransitive/self-propelled manner-of-motion verbs involving directed motion, i.e., Manner with a boundary crossing, as in *he walked into the park* (Levin and Rappaport Hovav 1992: 253). We limited ourselves to *in-out* situations because Hendriks and Hickmann (2015) show there is variation within and between languages in the likelihood with which they use satellite-framed constructions to encode motion events involving different situation types (e.g. *in-out* versus *across* situations). We also looked at learners' ability to transfer knowledge acquired from *in-out* situations to *towards* and *up-down* situations, i.e., Manner with no

boundary crossing, as in *he walked towards the park*. Narrowing the focus of the study to one situation type was considered to be good practice in light of VanPatten's (2004: 38) recommendation to "present one thing at a time" in PI.

3.1 Research Questions and Hypotheses

Story-telling production tasks were designed to address the following research questions:

RQ1: To what extent is input+output based instruction more effective than input-only in training L2 learners of English to unlearn the boundary-crossing constraint as measured by a production task, compared with an EI condition involving only information about the target structures?

If input+output training is more effective, the proportion of manner boundary-crossing expressions produced would exceed that for the input-only and EI conditions.

RQ2: To what extent can participants transfer their learning of motion event construals to manner constructions with no boundary-crossing not included in the training set?

If participants in the two instructional groups internalise a rule, rather than just learning the expressions from the training material by heart, it was expected that they would be successful in producing manner constructions with no boundary-crossing that had not been part of the intervention packages. Furthermore, it was expected that the frequency of such constructions would not increase for the EI group.

RQ3: To what extent does L1 language type affect the ease with which motion event constructions are acquired?

It was predicted that performance improvements in the two instructional groups would be most marked for participants whose L1 was V-framed and that the performance of S-framed participants would exhibit the least improvement. Furthermore, the performance of E-framed participants was expected to fall between the other two, given that motion event constructions in this language type contain elements similar to those of S-framed and V-framed languages.

4 Method

4.1 Participants

Eighty-three participants were recruited for this study. Fifty-nine were students attending a private language school in the South of the UK; they were allocated to the two instructional groups: input-only (IG, N=29) and input+output (IOG, N=30). An EI group of L2 English-

speaking participants was recruited from various departments at a UK University (EI, N=24) because, for logistical reasons, it was not possible to recruit additional students from the language school.

The EI group component of the study was conducted between March and September 2020 when Covid-19 related restrictions were in force. There were two consequences of this situation. Firstly, the planned recruitment of participants from the institution's pre-sessional English language courses for international students proved unsuccessful because the campus was closed and volunteers were reluctant to come forward; therefore, the authors recruited international students enrolled on various degree programmes across the university. Secondly, since face-to-face interactions were not feasible at that time, the procedure was conducted over Zoom for the EI group only.

The allocation of individuals to treatment type (IG, IOG and EI) was quasi-random to ensure that participants' first language types were as balanced as possible across the groups (Table 1), within the constraints of opportunity sampling. While it is difficult to unambiguously classify languages into different types, the majority of L1s were V-framed (60), followed by E-framed (13), and ten students had an S-framed L1. The large number of V-framed languages is not unexpected given that this type is the most frequent and can be considered to have a dominant pattern (Levinson and Wilkins 2006).

Table 1 Distribution of L1 Types in each Treatment Group

Language Type	Languages (number)	IG	IOG	EI
S-framed	German (8), Slovak (1), Polish (1)	4	5	1
V-framed	Arabic (14), Japanese (7), Portuguese (4), French (7), Spanish (7), Turkish (7), Korean (14)	22	23	15
E-framed	Chinese (10), Vietnamese (3)	3	2	8

There were more females (59) than males (24). The mean age was 24.34 (SD 9.75) for IG, 24.70 (SD 4.97) for IOG and 30.79 (SD 5.90) for the EI group. The proficiency levels of IG and IOG on the Oxford Quick Placement Test were 39.31 (SD 9.75) and 39.23 (SD 6.08), respectively, placing them exactly on the CEFR B1-B2 boundary (40), although their scores ranged from A2-C2; no significant difference was obtained between the mean scores. For the reasons stated earlier, the EI group consisted of university students; their mean proficiency level, based on IELTS scores, was 7.10 (SD 0.64), placing them in the C1 band, although scores ranged from B2-C2. CEFR comparisons revealed that the EI group means were higher than those of the IG (z=4.33, p<0.0001, r=0.59) and IOG (z=5.64, p<0.0001, r=0.77). While it would have been preferable if all three groups had been at the same level of English, the fact

that CEFR scores were lower among the instructional groups compared with the EI group at the outset makes it unlikely that any performance advantages of the former at post-test could be due to higher levels of English language competence in relation to the latter.

4.2 Experimental Schedule

Cartoon-based narrative tasks developed by the second author were used to measure students' ability to produce target-like responses to motion events at three time intervals: Pre-Test (PT), Immediate Post-Test (IPT) and Delayed Post-Test (DPT). The three tasks were based on two cartoon sequences (Robot Story 1 and 2): for logistical reasons related to conducting the study during lesson time in a private language school, all IG and IOG participants produced the narratives in the sequence 1-2-1. As it was possible to balance the sequence for the EI group, half these participants were also given the story sequence 1-2-1, and the other half the order 2-1-2. The sequence was counterbalanced in the EI group in order to identify any intrinsic characteristics of the two stories that may have affected the responses of the two instructional groups.

The schedule for the three treatment groups is summarised in Figure 1. After the PT, IG and IOG received an instruction package consisting of four 45-minute sessions; this was followed by the IPT. The length of the intervention was thus comparable to that of other PI-based studies (e.g. Marsden and Chen 2011). IG and IOG participants received the DPT two weeks post-instruction. For the EI group, after the PT, participants only received the Explicit Instruction session which formed part of Path Lesson 1 and Manner Lesson 1 of the materials for the instructional groups (Appendix A), after which they completed the IPT; the DPT was conducted two weeks later.

Schedule	IG and IOG		EI
Pre-Test (PT)			**Pre-Test (PT)**
Day 1	Robot Story 1		**Day 1**
			Grp 1: Robot Story 1
			Grp 2: Robot Story 2
Intervention			**Intervention**
Day 1: Path Lesson 1	Input-based	Input/Output-	**Day 1**
Day 2: Path Lesson 2	package	based	Explicit Instruction for Path
Day 3: Manner Lesson 1	(IG only)	package	and Manner (10 mins)
Day 4: Manner Lesson 2		(IOG only)	
Immediate Post-Test (IPT)			**Immediate Post-Test (IPT)**
Day 4	Robot Story 2		**Day 1**
			Grp 1: Robot Story 2
			Grp 2: Robot Story 1
Delayed Post-Test (DPT)			**Delayed Post-Test (DPT)**
Day 18	Robot Story 1		**Day 14**
			Grp 1: Robot Story 1
			Grp 2: Robot Story 2

Figure 1 Experimental Schedule

4.3 Design

The between-participant independent variables were treatment (IG, IOG and EI) and L1 type (S, V and E-framed L1); test time (PT, IPT and DPT) was the within-participant independent variable. The dependent variable related to the proportion of S-framed and V-framed motion events described by each participant at each test time: for the target structure, the percentage of all Path and Manner verbs used with or without a Boundary Crossing (+BC and -BC, respectively) was calculated, so that the sum of Path+BC and Manner+BC was 100%; similarly, the sum of Path-BC and Manner-BC percentages totalled 100%. This procedure provided a normalized measure for each participant's production at each test time that was not affected by the actual number of events each participant chose to describe (see section 5.1).

4.4 Productive Task: Narrative Elicitation

A picture-based story-telling task was preferred over written exercises not only because the latter might favour the output group which had practised such exercises during the intervention, but also because demonstrating that students can use target forms in a controlled productive task is not particularly convincing, as in this type of task students will be able to monitor their performance much more than in a free writing task. Being able to use the new

forms in a free writing task is much more demanding as attention needs to be paid to the logic of the story line as well (see Norris and Ortega 2000 for further discussion).

4.4.1 Materials

Two Robot Stories were designed for this study to elicit a range of motion expressions. The stories featured a child's toy robot moving through different situations in a variety of ways e.g., *walking, running, jumping, falling* for a total of 23 pictures per story; each picture was hand-drawn by an illustrator. Each story included 20 motion events of which 12 involved a boundary crossing where characters were depicted either going *into* or *out of* various locations, and 8 motion events where no boundary crossing was represented. There was potential for participants to produce more than 20 motion event verbs, if they chose to elaborate on the core events required to narrate the story. An effort was made to include characters, objects, actions and locations, the descriptions of which were likely to fall within the limits of the participants' vocabulary level.

As illustrated in Figure 1, participants performed the written task on three occasions: the same story was used at PT on Day 1 and at DPT two weeks later. The other story, containing similar events, was employed at IPT to avoid the possibility of students losing interest by having to complete the same task three times.

4.4.2 Procedure

For each Robot Story at each test time, participants were presented with a booklet containing one picture on each of the 23 pages and a response sheet providing a list of fields numbered 1-23 for participants' written responses. For IG and IOG, the cartoon sequences and response sheets were provided as a hardcopy booklet, whereas the images and response sheets were emailed to EI participants and downloaded at the appropriate point during the Zoom session. At PT, IPT and DPT, all participants were asked to write a short story based on the sequence of events by focusing as much as possible on the action rather than physical descriptions of the characters or environment. At least one sentence was requested for each cartoon picture in each story. Instructions were translated where necessary to ensure comprehension and bilingual glossaries of nouns were provided in the participants' L1 to facilitate descriptions.

4.4.3 Data Preparation

The PT, IPT and DPT narratives were coded with respect to the following four motion event types: Path+BC, Path-BC, Manner+BC and Manner-BC. Spelling mistakes were disregarded

as these were not the focus of the study. The first and second authors performed an inter-rater reliability check on 10% of the response sets across treatments and test times. No discrepancies occurred with respect to whether a main verb was Path or Manner. On 2.74% of occasions, differences in judgement were observed; these differences fell into two categories. Firstly, where the participants' misuse of prepositions created ambiguity, e.g., *he climbed over the window*, instead of *he climbed out of the window*. These differences were resolved by consulting the relevant image, and agreeing on the participant's intended interpretation. Secondly, some participants used idiomatic movement expressions, such as *take the stairs* and *find one's way*; the raters agreed whether or not to include these constructions; the full list of Manner and Path expressions coded can be found at Appendix B. All differences in coding categories were resolved by consensus.

4.5 Intervention Phase: IG and IOG

For the two instructional groups, the intervention comprised three stages: EI, initial and subsequent SI activities, which were applied to each of the Path and Manner lesson block (Figure 1). The IG package was based on PI principles as formulated in Wong (2004), in that it provided a) explicit instruction about the target structure, making sure that only one structure was presented at a time, namely first structures involving path, and then structures involving manner; b) explicit instruction about default strategies, which focused on learners' errors which involved continued mapping of path onto the main verb (instead of onto the satellite) and their failure to conflate manner in the main verb in boundary crossings and c) structured input activities that "push learners to abandon their inefficient default strategies for more optimal ones so that better form-meaning connections are made" (Wong, 2004, p.35). In these SI activities, learners were required to make new form-meaning connections by paying attention to form while interpreting the meaning of the sentence. Thus, learners kept meaning in focus and had a clear reason for attending to the input (Wong, 2004, p. 41 onwards). The input was presented to learners either in oral or written form, and embedded in Referential or Affective Activities, as required in a PI approach.

The differences between the IG and IOG instructional packages can be summarized as follows: while the EI was identical for both groups, SI tasks were tailored to IG, or IOG requirements. The IG consisted of input-only activities, whereas the IOG package combined input+output activities. One key difference between the packages was that while IG engaged in Affective activities, IOG undertook productive activities practising writing the target forms. Since Marsden and Chen (2011) found that Affective activities did not provide additional

benefits for learners in their study, it was felt that leaving these out in the intervention for IOG would not constitute a major disadvantage for that group. IG did not practise writing the target forms at all during the intervention. Time-on-task was strictly controlled, to ensure group differences after the intervention would not be attributable to differences in time spent on tasks.

Both packages were delivered over 4 x 45-minute lessons (one lesson per day over four days). PI guidelines recommend that only one concept be presented at a time, therefore, Path and Manner were taught as separate blocks with two days allocated to each.

4.5.1 Path Lessons 1 and 2

The first block of two lessons focussed on Path (Appendix C, Tables C1 and C2). EI drew attention to the basic typological differences between V-framed and S-framed languages (page 1 of Appendix A). In both sets of SI activities, series of still pictures were presented showing a Figure going *into*/*out of* different locations, in response to which participants performed tasks designed to encourage them to look for Path information on satellites rather than verbs, thus overcoming their L1-based default strategies.

The first SI session involved listening tasks. IG performed a sentence-picture verification task: participants listened twice to a sentence read out by the experimenter and then chose the picture that matched the sentence. On completion, the participants were given an answer key. IOG listened to a story twice and responded to comprehension questions in writing.

In the second SI session, participants read the input material: IG were asked to match the meaning of each sentence to the appropriate picture, and IOG responded to questions on the story in writing. After completion of these referential tasks, IG took part in Affective activities which required participants to give their views on the likelihood of scenarios, all of which involved a boundary-crossing event. Examples of typical Path Affective activities were:

Here are some actions which have been performed by your teacher this month.
Tick the actions that are also true for you.

1 He has jumped out of a box.

2 He has walked into a coffee bar.

In contrast to referential activities which offer positive and negative evidence of target forms, Affective activities provide only positive evidence. There were no right or wrong answers and

learners received no feedback regarding the target form. Instead of Affective activities, IOG wrote down the story they had just read.

On Day 2, Path referential activities involved connected discourse. Again, the exercise was constructed to encourage participants to attend to the satellite derive the appropriate meaning.

4.5.2 Manner Lessons 1 and 2

EI showed learners how manner information can be added to a motion event in English (page 2 of Appendix A). In the SI activities (Tables C3 and C4), auditory, text and visual stimuli were presented and participants performed tasks designed to focus their attention on the Manner of an event and how it is expressed in the main verb. Verbs included *run, fly, walk, climb, jump, swim, drive* and *crawl,* with the Path elements *into* and *out of.* Examples of Manner Affective tasks were:

Do you agree or disagree with the following sentences?	*Agree*	*Disagree*
1 I would never jump out of a plane.		
2 Once I walked into the wrong classroom.		

Instead of Affective activities, IOG performed a sentence completion task and provided personal experiences in writing.

4.6 Intervention Phase: EI Group

The intervention for EI consisted only of the EI stage for Path and Manner (Appendix A). As with the instructional groups, attention was drawn to language differences in the expression of path, making learners aware of the use of the Manner+BC construction in English. In all three conditions, the EI phase took 10 minutes; this duration is in keeping with that employed by White and DeMil (2013).

4.7 Exposure to Path and Manner Tokens

In total, IG and IOG were exposed to 260 tokens of the target forms (129 constructions focused on Path and 131 on Manner): 76 and 53 in Path Lessons 1 and 2, and 84 and 47 in Manner Lessons 3 and 4. EI was exposed to only four target forms during the EI phase, two Path+BC and two Manner+BC. The reader will recall that the purpose of the EI group was to distinguish any facilitative effects of EI from the SI elements of the packages.

5 Results

The majority of datasets were not normally distributed according to the Kolmogorov-Smirnoff test; therefore, non-parametric tests were used throughout. Mann Whitney was used for between-group analyses and Wilcoxon Signed Ranks Test and Friedman's Two-Way Analysis of Variance for within-group comparisons. Effect sizes were measured using *r*; according to Cohen (cited in Durlak 2009: 922), effect sizes between 0.10 and 0.29 are interpreted as small, between 0.30 and 0.49 as medium, and 0.50 and above as large. Bonferroni corrections were applied to multiple comparisons.

As mentioned in section 4.4.1, the two Robot stories each contained 12 boundary-crossing events and 8 non-boundary events that represented the core thread of the narrative, and that participants had the possibility of elaborating on these core events by including more motion events, if they had time and wished to do so. Figure 2 presents the average frequencies reported by each group at the three test times for the 20 motion event types.

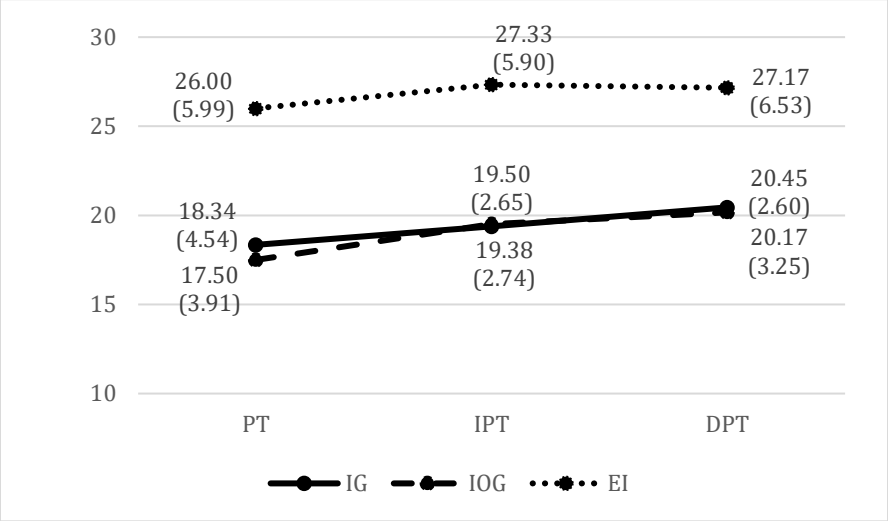

Figure 2 Mean frequencies (and standard deviations) of all motion event types produced by each group across test times

No significant differences were found between IG and IOG at any test time. The means in Figure 2 indicate that EI produced a greater number of motion events than the two instructional groups; this is most probably because, as discussed in section 4.1, the participants in EI were slightly more proficient than those assigned to IG and IOG, and were therefore more likely to report a greater number of events in the time available than the less advanced participants. These differences reached statistical significance at PT (EI vs. IG: z=4.49, p<.001, r=0.62), IPT (IE vs. IOG: z=4.78, p<.001, r=0.65) and DPT (IE vs. IG: z=4.08, p<.001, r=0.56). It is the fact that a consistent difference between EI and the two

instructional groups was observed that the percentage metric (described in section 4.3) was employed for all group comparisons reported in this paper. Finally, the increase in the frequency of total motion events reported between PT and DPT reached statistical significance for IG (z=2.18, p=.029, r=0.41) and IOG (z=2.95, p=.003, r=0.54), but the slight increase observed for EI failed to reach significance.

5.1 Manner+BC expressions: Comparison of Treatments

To evaluate whether input-only or input+output instruction had been more successful in training participants to unlearn the boundary-crossing constraint compared with the EI group (RQ1), the mean percentage of Manner+BC expressions produced at each test period were compared between IG, IOG and EI (Figure 3). No significant differences were found between the two EI sub-groups (the narratives were presented in the order 1-2-1 and 2-1-2) at any of the three test times, thus confirming that there was no difference in the likelihood of one story eliciting Manner+BC responses more than the other.

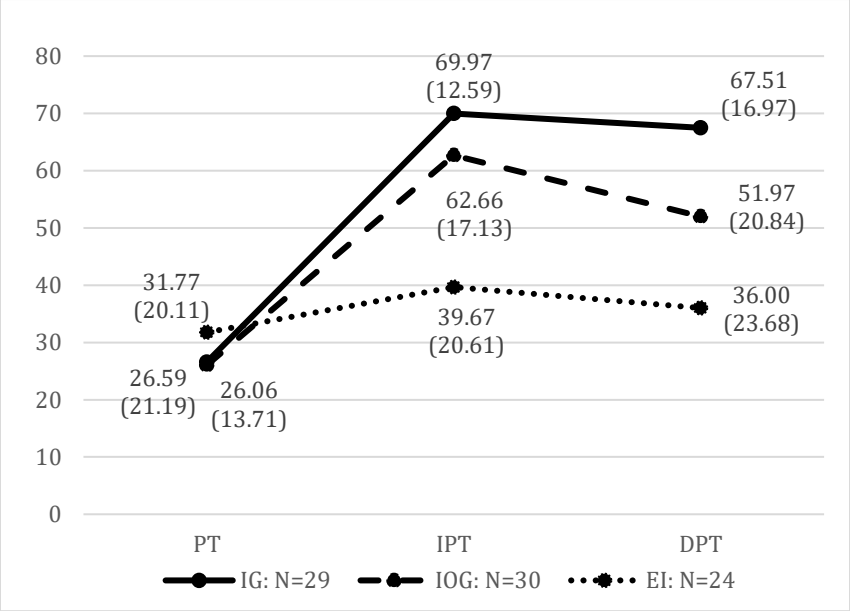

Figure 3 Mean percentages (and standard deviations) of Manner+BC expressions produced by each group across test times

Comparisons across the three time points show a robust significant increase in the production of target constructions for both instructional groups (IG: χ^2=37.32, p<.001, r=1.134; IOG: χ^2=38.19, p<.001, r=1.128), but not for EI. For the instructional groups, related pairwise analyses revealed significant increases between PT and IPT (IG: z=4.55, p<.0001, r=0.85; IOG: z=4.70, p<.0001, r=0.86) and between PT and DPT (IG: z=4.68, p<.0001, r=0.87; IOG: z=4.03, p<.0001, r=0.74), with a large effect size in both cases. No significant

differences were found for EI for these comparisons. For IG, the slight drop in the percentage of Manner+BC events produced between IPT and DTP did not reach significance, but the more marked decrease observed for IOG was significant (z=2.45, p<.014, r=0.45). The EI group showed no significant difference between IPT and DPT.

Between-treatment group comparisons revealed a different picture depending on test time. At PT, no significant differences were found across treatment groups, indicating that the proportion of target Manner+BC constructions produced was equivalent for all participants prior to any intervention. At IPT, the IG/IOG between-group comparison did not reach significance, but an effect was identified between IG and EI (z=4.84, p<0.0001, r=0.66) and IOG and EI (z=3.96, p<0.0001, r=0.54), where the proportion of Manner+BC events produced by EI was lower in both cases, as illustrated in Figure 3.

After a two-week delay, IG produced a larger percentage of Manner+BC constructions than IOG and this difference reached significance with a medium effect size (z=2.73, p<0.01, r=0.35), indicating that performance levels were better maintained in the delayed test following input-only instruction. The difference in means between EI and IG at DPT was statistically very robust (z=4.37, p<0.0001, r=0.60), but the comparison between EI and IOG did not reach significance.

5.2 Extension of Manner Verbs to -BC expressions

Figure 4 illustrates that the two instructional groups showed an increase in the proportion of Manner-BC expressions which had not been included in the training materials, such as *climb up, run up, run away, drive away* (RQ2). Significant increases were found between PT and IPT for both instructional groups (IG: z=4.54, p<.0001, r=0.84; IOG: z=4.21, p<.0001, r=0.77) and between PT and DTP (IG: z=4.11, p<.0001, r=0.76; IOG: z=2.58, p<.01, r=0.47). The drop in production of novel forms between IPT and DTP did not reach significance for IG or IOG. The comparison of means for EI revealed no significant differences between test times.

When considering between-group comparisons, Figure 4 also illustrates that the proportion of Manner-BC expressions produced by EI is larger than the two instructional groups at PT; these between-group differences reached significance for IG (z=3.33, p<0.001, r=0.46) and IOG (z=3.22, p<0.01, r=0.44), whereas the difference between IG and IOG was not significant. The larger proportion of Manner-BC event types produced by EI prior to the intervention may be attributable to the fact that the overall language proficiency of this group of university students was slightly higher than that of the instructional groups. Therefore,

these participants may have been more accustomed to using Manner-BC expressions in English, however, it must be noted that any enhanced language abilities of this group did not lead them to use the target Manner+BC construction more frequently than the two instructional groups at PT, as discussed above in relation to Figure 3.

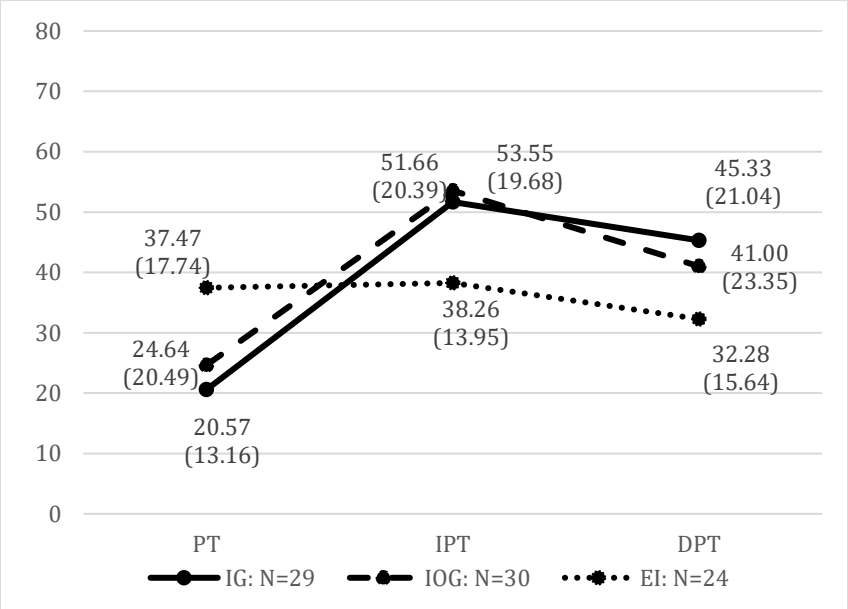

Figure 4 Mean percentages (and standard deviations) of Manner-BC expressions across test times

Figure 4 shows that at IPT, the proportion of Manner-BC expressions produced by EI is lower than that of the two instructional groups, which did not differ significantly from one another; the differences between EI and the instructional groups are significant in both cases (IG: z=2.97, p<0.01, r=0.41; IOG: z=2.64, p<0.01, r=0.36). These results indicate that the EI intervention on its own, without further focused instruction, did not induce the EI group to employ Manner-BC expressions more frequently, in contrast to the two instructional groups. After a two-week delay, the proportion of Manner-BC expressions produced by the two instructional groups did not differ significantly from each other or EI.

These findings indicate that IG and IOG learners were beginning to apply the acquired pattern to novel Manner expressions following instruction and that this tendency persists over a two-week delay with a minimal drop for IG, but a more marked decline for IOG. The EI group participants, on the other hand, maintained a steady use of Manner-BC constructions across the three test times, in line with their use of Manner+BC structures.

5.3 L1 Language Type Comparisons

The following analyses unpack these findings with respect to treatment and L1 language type (RQ3). The production patterns for Manner+BC constructions for participants with S-Framed,

V-Framed and E-Framed L1s are plotted in Figures 5a, 5b and 5c, respectively. The table of means and standard deviations relating to these graphs can be found at Appendix D.

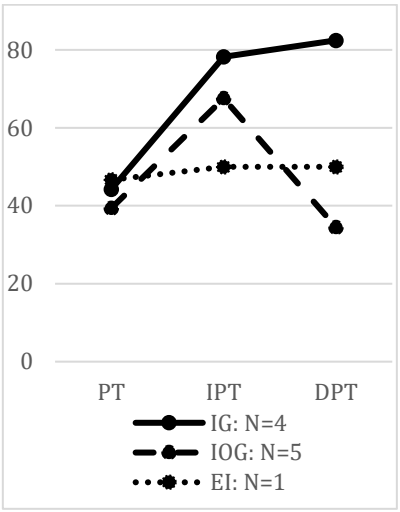

Fig 5a: S-framed L1

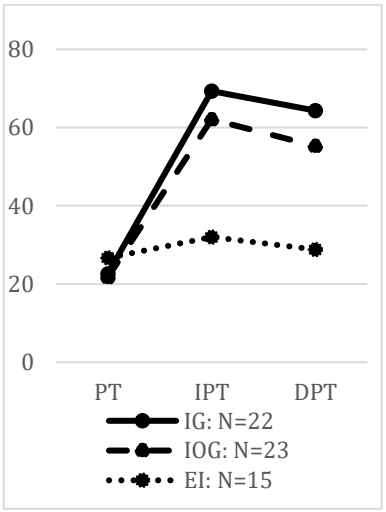

Fig 5b: V-framed L1

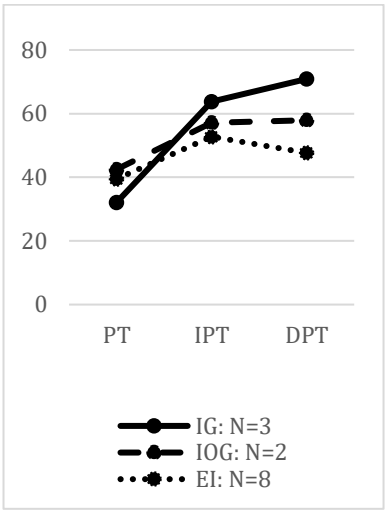

Fig 5c: E-framed L1

Figures 5a-c Manner+BC percentage means by language and treatment type

The graphs show similar treatment type patterns regardless of participant L1. All three graphs reflect the general trends observed in Figure 3, although in the S-framed and E-framed groups the number of participants in each language type is so limited that mean comparisons fail to meet the required significance criterion. Differences observed between test times are reported in the next section, followed by differences observed between treatment and L1 types.

5.3.1 L1 type performance differences between test times

Firstly, let us focus on the relative effectiveness of instruction type for each L1 type. Figure 5a indicates an increase in production of target structures across the three test times for the S-framed L1 group, however, due to small sample sizes, these effects do not reach significance for any of the treatment groups; this is also the case for the participants with E-framed L1s (Figure 5c). For V-framed L1 groups (Figure 5b), significant increases across the test times were obtained for IG (χ^2=27.79, p<.0001, r=1.12) and IOG (χ^2=33.36, p<.0001, r=1.20), but not for EI.

An increase in the production of Manner+BC events between PT and IPT, and PT and DPT is evident for each language type (Figures 5a-5c). Owing to low N values in the S-framed and E-framed groups (Figures 5a and 5c), pairwise comparisons did not reach significance, but robust size effects can be observed for the V-framed L1 group (Figure 5b),

IG: PT-IPT: z=4.04, p<0.001, r=0.86; IG: PT-DPT: z=4.07, p<0.001, r=0.86; IOG: PT-IPT: z=4.11, p<0.001, r=0.86; IOG: PT-DPT: z=4.11, p<0.001, r=0.86; EI mean differences were not significant.

5.3.2 L1 type performance differences between treatment types

The number of participants with a V-framed L1 is considerably larger than that of the other two L1 types; the instructional group datasets (Figure 5b) revealed robustly significant pairwise comparisons with respect to EI, producing more target structures at all test times. At IPT, IG-EI: z=4.71, p<0.0001, r=0.77; IOG-EI: z=3.99, p<0.0001, r=0.65, and at DPT, IG-EI: z=4.20, p<0.0001, r=0.70; IOG-EI: z=3.30, p<0.001, r=0.54. Due to small group sizes, no inter-treatment comparisons were significant for the S-framed and E-framed L1 groups (Figures 5a and 5c).

5.3.3 Treatment performance differences by L1 type

Let us now look at the means plotted in Figures 5a-5c organised by condition to observe key differences that occurred across L1 types within a single treatment. Figures 6a, 6b and 6c present the replotted means (Appendix D).

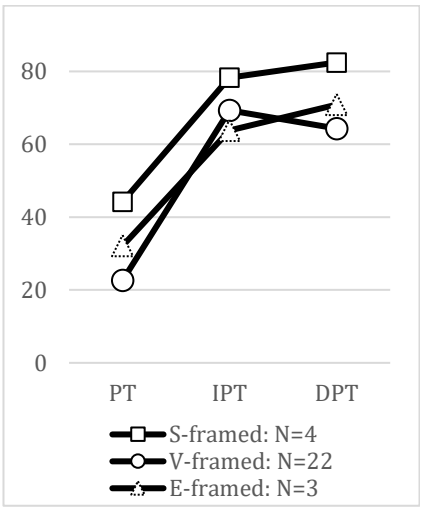

Fig 6a: IG Treatment

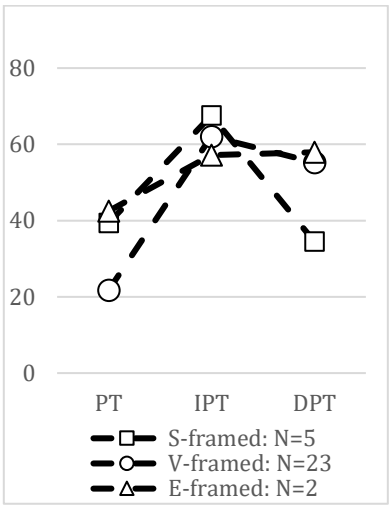

Fig 6b: IOG Treatment

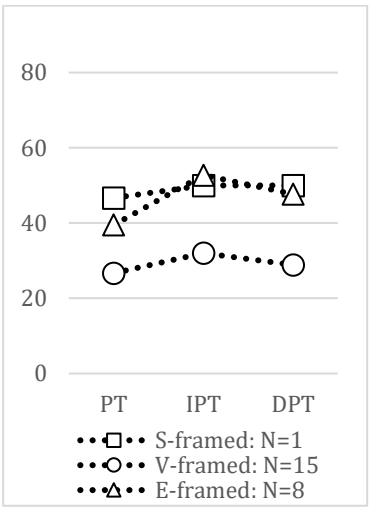

Fig 6c: EI Treatment

Figures 6a-c Manner+BC percentage means by treatment and language type

In the two instructional conditions, participants with an S-framed or E-framed L1 produced a larger proportion of target structures at PT compared with the V-framed L1 group (Figures 6a and 6b), however, these differences did not meet the adjusted α criterion. These trends indicate that, prior to instruction, participants whose L1s are S-framed or E-framed were, unsurprisingly, more familiar with the target structures than participants with a V-

framed L1. Although the same tendency is observable in EI (Figure 6c), no significant differences were found between L1 types at PT. Figures 6a and 6b indicate that in the instructional conditions the greater proportion of Manner+BC constructions produced by participants with S-framed and E-framed L1s at PT disappeared at IPT and DPT, with the single exception of the IOG condition at DPT, where this L1 group displayed poorer performance than the V-framed L1 group, although mean differences did not reach significance.

6 Discussion

The current study assessed the teachability of motion event construal, with a specific focus on whether L2 learners of English with a variety of L1s can acquire the target-like expression of manner of motion involving a boundary crossing, compared with a group who only received explicit information about the target structure. This assessment aimed to fill a gap in our knowledge regarding the relative contribution of input and output practice for L2 acquisition of motion event construal, with respect to productive tasks.

The results provide convincing evidence that input-only instructional techniques, as advocated by the PI approach, are more effective in training L2 learners of English to unlearn the boundary-crossing constraint than a combination of input and output procedures, compared with a group who received explicit information but no structured activities. The proportion of Manner+BC over Path+BC constructions between PT and IPT (Figure 3) increased for IG by 43%, compared with 37% for IOG, and this level was maintained over a 14-day period with only a 2% decrease in frequency for the former, compared with an 11% fall for the latter. Although a weak increase in target structure production was observed for the EI group between PT and IPT (8%), it is suggested that this was attributable to participants' enhanced awareness of Manner+BC constructions in English during the EI exercise; but this increase did not reach significance and fell by 4% after two weeks, thus demonstrating the resistance of participants to adopt the target structure in the absence of intensive instructional procedures. This finding concurs with the conclusions drawn by VanPatten and Oikkenon (1996) that, on its own, EI has a negligible effect on the acquisition of the target structure. Taken together, the overall findings provide strong evidence that motion event construal can indeed be taught and that an input-only intervention based on PI principles is a promising pedagogical approach to the teaching of such complex aspects of English.

The relative success of input-only instruction over the input+output package after a two-week period appears contrary to the findings of DeKeyser and Prieto Botana (2014); in the current study, adding a productive component to the input-focused tasks reduced the efficacy of the training after two weeks. In an attempt to unravel the reasons for this unexpected outcome, let us consider the possible effects of the instructional packages. While DeKeyser and Prieto Botana (2014) claim that the lack of success for output-based instruction in PI studies is likely due to the mechanical drill nature of the activities in the output-based group, this cannot explain the relatively lower performance of IOG in the productive tasks used here, since they did not resemble mechanical drills in any way. Of course, the three written elicitation Robot Story tasks involved producing output, but these were the same for both instructional groups and no feedback was given.

The current findings can be interpreted as supporting VanPatten's view that prior to moving on to output practice, input needs to be fed into the learner's developing linguistic system. Indeed, the inclusion of production tasks during the SI phase for IOG and the subsequent backsliding at DPT may mean that these participants had been pushed prematurely into production before allowing input to become intake. The Affective activities may have led to greater intake of the manner and path combinations for IG, which in turn may have prompted these learners to make the necessary adjustments in their expression of motion that endured more successfully after a delay. This advantage would seem to provide support for VanPatten and Cadierno's (1993) observation that focusing on enhancing how input is processed can lead to greater availability for production.

IG and IOG participants were also able to produce Manner-BC structures that had not been taught during the intervention (Figure 4), which means that they generalised knowledge acquired during the training to novel constructions. Participants had thus acquired a rule and were not just reproducing structures they had learned by heart.

A comparison of the effectiveness of the intervention for learners with different L1s revealed that both instructional groups benefited from the instruction packages, compared with the EI group (Figures 5a-5c). Thus, gains cannot be attributed to the Explicit Instruction which all groups received.

The S-framed and E-framed L1 groups tended to produce a larger proportion of target structures prior to instruction compared with the V-framed L1 participants, although this observation was not supported by statistical analysis owing to the small group sizes of the first two groups. Nevertheless, any differences between L1 groups were eliminated once the training packages were administered. Inter-language type comparisons (Figures 6a-6c)

confirmed predictions that the V-framed group would benefit most from instruction: between PT and IPT, the proportion of structures produced by the V-framed L1 group increased by 47% (IG) and 40% (IOG), the E-framed L1 group by 32% (IG) and 15% (IOG) and the S-framed group by 34% (IG) and 28% (IOG). This trend was predicted since V-framed languages do not incorporate Manner in motion events involving a boundary constraint, in contrast to S and E-framed languages which permit patterns similar to the Manner+BC construction in English. Therefore, in spite of the challenges for both teachers and learners in the L2 motion domain, progress can be made with instruction that recognises underlying cross-linguistic influences and that gives learners input-oriented activities structured in a way that guides them away from their default settings and encourages retreat from transfer-induced undergeneralization (White 1991).

A limitation of the study regards the duration of the instructional interventions which at 180 minutes was relatively short and did not allow for revising, revisiting or recycling. However, as Marsden (2006) reports, longer interventions do not necessarily produce a better result. Furthermore, small sample sizes of S and E-framed L1 types severely limited the degree to which it was possible to test language type differences in depth.

7 Conclusion

The main aim of the study was to investigate a relatively neglected area in language teaching with the purpose of providing guidance for instructors wishing to approach the motion domain in the ESL classroom. In parallel, the study evaluated the relative effect of different instructional approaches on productive task performance, compared with explicit information on the target feature in the absence of any structured activities: results demonstrated a positive effect of input-focused treatment, while the addition of output training did not enhance performance immediately after the administration of training and in fact produced degraded performance after a two-week gap. The overall findings confirm that input-only instruction is effective in training L2 learners of English to unlearn the boundary-crossing constraint, and that learners undergoing such training should receive the kind of input that enables them to restructure their interlanguage even for structures that are “exceptionally resistant to restructuring in adult second-language acquisition”, as is the case with motion event patterns (Slobin 1996: 89).

It would seem that focusing on a single contrasting pair of path components e.g. *into* vs *out of*, thus following VanPatten’s (2004) principle to present one thing at a time, allows

learners to focus their attention towards mastering the S-framed pattern. A brief explanation from the instructor on possible cross-linguistic differences in motion construals would also appear to be helpful, particularly for students whose L1 is not S-framed, although, as demonstrated by the group who only received explicit information on the target feature, such an overview on its own, without an instructional package, is not sufficient for students to move away from L1-determined motion event lexicalisations. In subsequent lessons, manner-of-motion verbs already present in the learners' repertoire, such as *run* or *walk,* can be used to introduce the conflation of the manner component. In a final phase, a wider range of Manner+Path combinations may be introduced. Overall, it would appear that by increasing the transparency of the S-framed structure and providing graded instruction, learners may be able to interpret and produce a variety of Manner+Path combinations despite the cognitive difficulties that the mastering of this particular structure entails.

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