How to Design a Study:  
Pushing the Visual Envelope  
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1. Introduction  

To obtain a full understanding of a single phenomenon, collecting data from multiple tasks is often informative. However, unless tasks are properly controlled, it might be only luck that the results obtained from different tasks capture the same phenomenon. While variation in performance may stem from task features, such as contextualization of prompt or the choice of the linguistic target, the developing nature of learner-language may contribute as well (Ellis, 1994, 2009; Tarone, 1988). Since L2 acquisition research is interested in revealing how the learner’s linguistic system develops, it is essential to plan built-in controls to mitigate the joint effect of the different variables during data collection. This paper argues that viewing an acquisition phenomenon from two perspectives provides a deeper understanding. Results from experimental data also demonstrate how visually enhanced design can reveal facets of learners’ developing knowledge of boundedness in the spatial domain.

Boundedness is primarily a temporal concept and has been studied extensively in L2 tense-aspect research. Studies following a syntactic approach typically employ judgement tasks, alone or in combination with sentence-level conjunction tasks. Such studies explore the meaning representations that L2 learners hold for various aspectual morphological forms, including verbal and nominal elements, by presenting them through written stimuli (Montrul & Slabakova, 2002; Slabakova, 1999, 2001, 2002; Slabakova & Montrul, 2002, 2007). After reading the scenario, learners are asked to make a judgment about a sentence or its compatibility with the previous one based on semantic content.

While these studies greatly contribute to our understanding of the representations that learners hold for aspectual morphology, they may also be subject to critique. First, because written stimuli require the learner to interpret events by decoding linguistic cues prior to responding to the prompt, this mode of presentation may introduce a performance variable. Second, studying boundedness through sentence-level judgments does not fully answer the fundamental question of second language acquisition, i.e. “How do form-meaning associations evolve during interlanguage development?” This limitation lies in the forms that are selected for the study. Guided by theoretical assumptions about how the language works, these studies may test a limited type or range of forms, and thus limit documenting L2 development at the earlier stages. Third, the tense-aspect literature shows a much stronger support for claims regarding the emergence of the perfective than the imperfective (Bardovi-Harlig, 2000). Although the above studies consistently show that ultimate attainment in the domain of tense-aspect is possible, documenting the development of the imperfective lags behind. To fill this gap, a study is needed that examines the two forms equally (Bardovi-Harlig, 2005). Finally, an additional methodological challenge is due to the inherent nature of events and how people talk about them. It is recognized in the aspect literature that there is a difference between events of the world and their conceptualization (Krifka 1998; Smith, 1983, 1997). Events in the world are not inherently bounded or unbounded but, rather, the distinction is shown in the expression used to describe the event. In other words, the interpretation and description of a given event as bounded or unbounded reflects the speaker’s choice (Comrie, 1976; Smith, 1997). This means that researchers also have to consider and control for the subjectivity of conceptualization when developing tasks.

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With the above considerations, this paper presents a production task and a comprehension task that successfully capture how form-meaning connections evolve in the developing L2 system as expressed in the bounded-unbounded distinction. I will demonstrate this through the acquisition of Hungarian, a language with a robust system of morpho-syntactic marking in the spatial domain. The following section lays out relevant facts of boundedness and motion events in Hungarian.

2. Boundedness in Hungarian Motion Expressions: Particles and Motion Verbs

The concept at the center of the study is boundedness. Boundedness is part of the temporal semantic system and concerns the notion of endpoints. In this study, boundedness is applied to the spatial domain in descriptions of motion events and it is operationalized as follows: an event description is bounded if it describes a motion event that has reached its spatial limit (end-point); otherwise, it is unbounded. Examples (1) and (2) illustrate these concepts in the description of a ‘swimming to shore’ event in English:

(1) John swam to the shore.
(2) John swam towards the shore.

Upon viewing the same event, speakers may choose to report it using the particle ‘to’ (Example (1)). This description implies that John reached the spatial endpoint of the swimming event and he is on the shore. Thus, this sentence renders the motion event as bounded. In contrast, in example (2), the speaker chose to describe the event by using the particle ‘towards’. In this description, the information whether John reached the shore or not is underspecified. Thus, sentence (2) renders the event as unbounded.

The language used to illustrate the tasks here is Hungarian, a Finno-Ugric language. Due to its uncommonly rich lexical and syntactic possibilities in the spatial domain, Hungarian is ideal for this acquisitional study. Among grammatical forms used to express the bounded-unbounded distinction are the following linguistic devices: postpositions, circumpositions, adverbial phrases, resultative predicates, nominal case suffixes, postpositional suffixes and verbal particles (Hegedűs, 2006). Of these, particles are the primary forms, and within the context of this study, the focus is on spatial particles, i.e. words such as up, down, out, in, into in English.

The examples in (3) illustrate the bounded-unbounded distinction in Hungarian using the particle fel (‘up’) and the motion verb úszik (‘swim’). The first line presents the original Hungarian sentence; the second line shows a simplified gloss marking the relative ordering of the particle and the verb with a caret sign and spatial suffixes with a period.

(3) a. Egy bálna felúszott a Temzén Londonig.
   whale up^swam the Thames.on London.to ✓ in 30 min./*for 30 min.
   A whale swam up the Thames to London.
   b. Egy bálna úszott fel a Temzén Londonig.
   whale swam^up the Thames.on  London.to ✓ for 30 min./*in 30 min.
   A whale was swimming up the Thames to London.2

(Adopted from MTI, 2006, January 20)

The first sentence reports the swimming event as one in which the whale swam the Thames all the way up to London. There is no more ‘river’ to swim to arrive in London. Thus, it is a bounded description of the event. The second sentence, in contrast, reports the same swimming event without making mention to whether the whale actually swam all the way up to London or not. Thus, it is an unbounded

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1 All examples are given in the past tense (section 4.2)

2 Relevant form-meaning associations arise in neutral reading of the sentence. By emphasizing bálna (‘whale’) in sentence (3b), for example, the sentence will answer the question “Who swam up the Thames?” and shifts the communicative focus of the intended message away from the motion event.
description. Notice that the arising meaning difference is due to the position of the particle relative to the motion verb. In example (3a), the particle fel (‘up’) is in pre-verbal position relative to úszott (‘swam’), and this ordering gives rise to bounded interpretation. In example (3b), the particle fel is in post-verbal position relative to the verb úszott (‘swam’) and this corresponds to unbounded interpretation. The difference between the two readings is also confirmed through the in/for X time adverbial test (Vendler, 1967; for Hungarian see Csirmaz, 2008). While the first sentence (3a) is only compatible with the 30 perc alatt (‘in 30 minutes’) adverbial, the second example (3b) is only compatible with the phrase 30 percig (‘for 30 minutes’). The above correspondences between meaning and structure hold for all motion predicates made up of spatial particles and motion verbs in Hungarian. The examples further show that performance in the domain of boundedness is not only a matter of grammatical correctness but one of choice. While the speaker may choose to conceptualize an event as bounded or unbounded, once this decision is made, the linguistic means of rendering this choice are restricted.

Against this background, next, I briefly describe the participants of the study and then proceed to present task design, the focus of this paper.

3. Participants

I collected data for this cross-sectional study from adult learners and native speakers (NSs) of Hungarian. The learners (n=35) were recruited from two sites: one group studied Hungarian in the U.S. and the other group in Hungary. Since the study environments and program types differed, it was essential to establish an independent measure of proficiency. Previous L2 tense-aspect studies of instructed second language learners have shown that the rate of appropriate use of past tense verbal morphology in past contexts is a relevant measure related to boundedness (Bardovi-Harlig, 2000). These studies calculate rates of appropriate use from data typically elicited from a narrative retell task. To make current results comparable with previous studies, I adopted the same method. Four different proficiency groups emerged from the analysis and these were labelled as Group 0 (n=5), Group 50 (n=5), Group 80 (n=18), and Group 100 (n=7). The group numbers indicate the lowest rate of appropriate use of past morphology. For example, Group 0 included five learners who marked past tense between the rates of 0 percent and 50 percent of the time, while Group 100 included seven learners who produced past morphology appropriately and systematically in their narratives.

A group of 115 NSs of Hungarian also completed the comprehension task. These NSs were college students and matched the L2 learners in age as well. Since this study introduces a novel method in the L2 study of boundedness, the NSs served both as a control group and as a fifth proficiency group.

The learners completed the production task first, which was an enhanced version of the well-known narrative retell task.

4. Personalized Narrative Retell Task

As argued in the literature, aspect assumes relevance at the level of discourse (Dahl, 1984; Depraetere, 1995; Hopper, 1979, 1982; Smith, 1983). Therefore, I chose the narrative, a widely used production task in L2 tense-aspect research, to elicit and examine the use of spatial particles and motion verbs in motion expressions (Bardovi-Harlig, 2013). By definition, the narrative is a text type in which "the speaker relates a series of real or fictive events in the order in which they took place" (Dahl, 1984, p. 116). The significance of narrative texts in L2 tense-aspect research rests on the regular correspondences between discourse structure and the distribution of aspectual morphology (Bardovi-Harlig, 2000, 2005). Narrative structure is comprised of two major elements: the foreground and the background (Dry, 1981, 1983; Hopper, 1979; Labov, 1972; Labov & Waltezky, 1967). While the foreground narrates the sequence of main events and thus moves discourse forward, the background provides supportive material. The movement in the foreground is typically encoded through perfective morphology and the background is associated with the imperfective.
4.1. Materials

I chose the personalized narrative retell task. In this task “participants take the role of a protagonist in a film or story and tell the story form the first person perspective” (Bardovi-Harlig, 2013, p. 246). Personalized narrative retells are valuable because they elicit rich descriptions and promote frequent use of tense-aspect morphology while also allowing the researcher to control content and thus make learner productions comparable. To maximize the benefits of this task, I created a modified version of the children’s storybook entitled *Amanda and the Mysterious Carpet* (Krahn, 1985). The story tells the adventures of a little girl, Amanda, and a carpet delivered to her house. The carpet turns out to be a flying carpet, and this property leads to a day full of mischievous events. The modified story was presented on 15 pages and contained 12 planned motion event scenes. Since the learners could choose either the girl’s or the carpet’s perspective for the retell, both characters had to participate equally in the same type of events. This was achieved by creating scenes in which both Amanda and the Mysterious Carpet act together mirroring or responding to each other’s actions.

To elicit an increased number of motion expressions and to create balanced opportunities for the production of the same motion event type in both bounded and unbounded contexts, I graphically augmented motion events by manipulating path-boundedness. I did this by cutting and placing characters and objects in motion along different points of their motion paths. The visualization of the bounded-unbounded opposition is based on Smith’s (1997) metaphor of the camera lens. The effect of zooming in and zooming out on events can be achieved graphically by creating a slow motion effect, which allows for showing a series of frames of the same motion event.

![Figure 1. Visualization of a [FALL] event in planned bounded context.](image)

To imply bounded event context, two or three different event types were displayed on the same page. In the example of the [FALL] event (Figure 1, second frame), the first frame on the page depicted a [FLY] event, where the carpet flew above the house with Amanda sitting on it. The third frame illustrated a [SLIDE] event that occurred after her [FALL]. Thus, in this task boundedness was implied overtly through picture serialization.

The planned bounded [FALL] event had a matching planned unbounded [FALL] event pair. The visualization of this event is illustrated in Figure 2. To suggest the unbounded context, I placed two or three frames of the same type of motion event on the same page of the booklet. Previously, the carpet unexpectedly curled up and flew up to the ceiling, then dropped Amanda off. This series of three pictures capture Amanda and her book along different points on the same spatial path.

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3 Square brackets indicate motion events and are distinguished from their description (Krifka, 1998).
4.2. Procedure

Learners completed the narrative task individually in real time. Instructions were given verbally in English. Learners were told that they would see a children’s story-book without words, and after previewing the story, they would take on the perspective of one of the two main characters and tell the story from that character’s perspective in first person.

The retells were produced unrehearsed. Learners previewed the storybook twice prior to the retell, following Bardovi-Harlig (1995). The goal of the quick previews was to allow learners to establish the spatio-temporal flow of each motion event and their relation to each other while developing a goal-oriented perspective on the plot. Subsequently, they chose either Amanda’s or the Carpet’s perspective. The researcher signaled that learners had a long turn for a monologue and established the past as the temporal frame for the narration by saying ‘Hallottam valami varázslatos dolog történt veled.’ (‘I heard something magical had happened to you.’).

4.3. Predictions

It was expected that L2 learners will recognize graphically manipulated paths as bounded vs. unbounded events, and they will express this contrast in production. Notice that this production task seeks to reveal how learners contrast meanings during L2 development using spatial particles and motion verbs. Therefore, no specific predictions follow and the analysis is data driven.

4.4. Results

The narrative production task yielded 35 learner narratives of varying lengths (3-11 minutes). The transcript of the audio-files contained 1722 predicates for evaluation, and these were submitted to analysis. In narrative production, learners create their own text and the context against which the analysis is performed (Bardovi-Harlig, 2013). This means that during analysis the profile of each event is established in the context of the surrounding events instead of relying on the prompt alone.
After analyzing the narratives for the appropriate use of past morphology to group the learners, the retells were broken down into clauses and each was tabulated as narrating a motion event or a non-motion event. The analysis revealed that the narrative task elicited a total of 527 motion predicates (Table 1), and these were analyzed for structure. Results are reported by groups and individual examples illustrate relevant production patterns.

Table 1. Number of clauses and motion predicates in L2 narratives by group

<table>
<thead>
<tr>
<th>Group</th>
<th>All Narrative Clauses</th>
<th>Motion Clauses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean number of clauses</td>
<td>S.D.</td>
</tr>
<tr>
<td>Group 0 (n=5)</td>
<td>34.0</td>
<td>17.5</td>
</tr>
<tr>
<td>Group 50 (n=5)</td>
<td>41.2</td>
<td>10.0</td>
</tr>
<tr>
<td>Group 80 (n=18)</td>
<td>47.8</td>
<td>16</td>
</tr>
<tr>
<td>Group 100 (n=7)</td>
<td>63.4</td>
<td>38.2</td>
</tr>
</tbody>
</table>

According to Table 1, as the mean number of clauses increased in the retells with level of proficiency, the mean number of clauses narrating motion events remained constant. The mean number of motion events (Table 1, column 5), which were the thematic carriers of the stimulus, slightly increased from 14.6 predicates in Group 0 to 17.4 predicates in Group 100. This mean corresponds to the number of motion events overtly displayed in the book, which means that this was a successful elicitation.

Since the goal of this study was to explore how learners encode the bounded vs. unbounded distinction using spatial particles and motion verbs, each clause narrating a motion event was categorized as describing a bounded or unbounded motion event. The structural analysis of motion expressions revealed that learners produced verb-only, particle-verb and verb-particle structures, as expected. However, they also produced four additional, unpredicted forms. The latter included particle-only predicates and reduplications of single predicates, not attested in native speaker production (Table 2).

Table 2. Range of L2 motion predicates: narrative retell task

<table>
<thead>
<tr>
<th>Structure</th>
<th>Example with gloss</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P^V</td>
<td>fel*repült</td>
<td>up^flew</td>
</tr>
<tr>
<td>V-only</td>
<td>repült</td>
<td>flew</td>
</tr>
<tr>
<td>V^P</td>
<td>repült fel</td>
<td>flew up</td>
</tr>
<tr>
<td>P-only</td>
<td>fel</td>
<td>up</td>
</tr>
<tr>
<td>Reduplicated P^V</td>
<td>fel<em>repült fel</em>repült fel*repült</td>
<td>up^flew up^flew up^flew</td>
</tr>
<tr>
<td>Reduplicated V-only</td>
<td>esik esik esik</td>
<td>fall fall fall</td>
</tr>
<tr>
<td>Reduplicated P</td>
<td>fel fel</td>
<td>up up</td>
</tr>
</tbody>
</table>
A closer examination of planned events revealed an interesting pattern between predicate structure and boundedness of context. This is illustrated through the mapping of the [FALL] event that was planned to elicit both bounded and unbounded descriptions (Table 3).

Table 3. L2 mapping of [FALL] event in bounded and unbounded contexts by structure

<table>
<thead>
<tr>
<th>Predicate Type</th>
<th>Tokens (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bounded Context (N=13)</td>
</tr>
<tr>
<td>V-only</td>
<td>1 2 2</td>
</tr>
<tr>
<td>Vx2</td>
<td>1 2</td>
</tr>
<tr>
<td>P^V</td>
<td>1 4 2</td>
</tr>
<tr>
<td>(P^V)x2</td>
<td></td>
</tr>
<tr>
<td>V^P</td>
<td>1 1 1</td>
</tr>
</tbody>
</table>

In the planned bounded scene a jar of jam falls out of Amanda’s hands as a result of the carpet’s wiggling. This scene was described in 19 narratives, and it was described as an instance of [FALL] in 15 retells. The unbounded pair of the [FALL] event, presented over three pictures, shows Amanda’s falling off the rug. Learners produced 34 motion expressions in response to this scene, including 23 descriptions as [FALL]. Looking at the overall distribution of the expected forms, we can see that the most frequently produced forms across contexts were the V-only and P^V forms. The V^P form was also expected but it was produced in very low tokens. By examining the occurrence of these structures within contexts, we can notice that the descriptions of [FALL] in bounded contexts contained only simple predicate-types, such as V-only, P^V, and V^P. In unbounded contexts, though, we can also find reduplications of these simple types.

Here are two actual examples from narrative production that illustrate the use of spatial particles and motion verbs across contexts. The first extract is taken from Learner 11’s transcription (Group 50), and the lines of interest are marked with an arrow. The first mention of this event took place in the kitchen and the second in the yard (example 4):

4 The caret symbol shows the linear ordering of particles and verbs. Left and right carets indicate that the phrase inside was produced at a different tempo relative to the surrounding speech. The notation (.) indicates a pause of less than 5 seconds.
(4) Excerpt from Learner 11’s narrative

27→ és enyém fel\emph{\textasciitilde}emelkedett
and mine \textasciitilde lifted
and lifted me up

28 és a konyhába ment
and into the kitchen went

32 és akkor (.) akkor az udvarra ment
and then then to the yard went

33→ és $>$fel\emph{\textasciitilde}emelkedett és fel\emph{\textasciitilde}emelkedett és fel\emph{\textasciitilde}emelkedett$<$
and $>$ up\emph{\textasciitilde}lifted and up\emph{\textasciitilde}lifted and up\emph{\textasciitilde}lifted $<$

On line 27 of the narration, the event was presented as a planned bounded event. In response to this scene, Learner 11 used the particle \emph{fel} (‘up’) in preverbal position. This indeed suggests bounded event interpretation. Later, on line 33, planned as an unbounded event, the same particle \emph{fel} still occupied the preverbal position. However, this time the unbounded interpretation arises from the repetition of the simplex predicate and the change in tempo of production.

To demonstrate native-like control of the spatial particle use, here is an excerpt from Learner 9’s narrative (example 5).

(5) Excerpt from Learner 9’s narrative

48 → és én: u u hirtelen le\emph{\textasciitilde}estem a majdnem na le\emph{\textasciitilde}estem
and I suddenly down\emph{\textasciitilde}fell the almost actually down\emph{\textasciitilde}fell
and I suddenly fell down the almost actually I fell down

49 → De mikor estem\emph{\textasciitilde}le
but when I fell\emph{\textasciitilde} down
but when I was falling down

50 akkor még volt idöm valamiről gondolkodni
I still had the time to think about something

Line 48 narrates Amanda’s sudden fall. The event was presented in a single picture to imply bounded context. On the first line of the extract, Learner 9 used the particle \emph{le} (‘down’) in the preverbal position, which indeed implies bounded description. On line 49, which was an elaboration of the event and not included in the booklet, the learner zoomed in on the [FALL], suggesting unbounded conceptualization. Here, though, the learner used the same particle \emph{le} in post-verbal position, which indeed implies unbounded interpretation. This learner’s production is unique because it provides direct evidence to contrastive use of particles in mapping events to predicate structure.

Although contrastive use of expected forms were only attested in Learner 9’s production, by looking at the elicited structures across contexts we can observe L2 development (Table 3). We can notice that in bounded contexts V-only retreated from production and the P\emph{\textasciitilde}V ordering gained prominence, as expected. In unbounded context, learners produced reduplicated forms and there was also a retreat from the P\emph{\textasciitilde}V structure, the latter being a desirable development. These observations hold across proficiency groups and motion predicates made up of different lexical combinations of particles and verbs. Thus, when expanding the analysis to include both the expected and unexpected forms, the following patterns avail in the production of verb-only and particle-verb predicates, the most frequently produced two forms across contexts at each level (Figures 3 and 4).
Figure 3. Distribution of V-only vs. (Vx2) motion predicates across bounded and unbounded contexts in L2 narratives
What we can see in the graphs is that motion predicates contain single structures (Figures 3 and 4, upper half) and their reduplicated structures (Figures 3 and 4, lower half). However, during narration, these forms were not applied randomly. For example, the structure V-only occurred in both bounded and unbounded contexts, but the reduplicated verb-only predicate was restricted to unbounded contexts. Similarly, the prefixed particle-verb structure occurred both in bounded and unbounded contexts, but the reduplicated form was attracted to unbounded contexts only. These distributional patterns were also...
attested for the P-only vs. its reduplicated pair. Learners employed these strategically and in well-identifiable motion-scenes in the story. Further evidence for treating such reduplicated forms as a single meaning unit comes from Fields (2004), who argues that prosodic cues often coincide with syntactic boundaries and in real-time performance task, such as this narrative retell, prosodic cues aid the listener by communicating the intended meaning in an efficient way.

In summary, as expected for narrative performance, the learners systematically expressed the meaning contrast in production. The reduplicated forms in unbounded contexts showed that during interlanguage development L2 learners utilize their existing linguistic repertoire to zoom in on the path of a motion event and indicate removal of the spatial endpoint in event descriptions. This allows them to distinguish unbounded motion events from bounded motion events.

The narrative task was followed by a recognition element, a novel computerized task. This is detailed next.

5. Audio-Visual Judgment Task

I developed an audio-visual judgment task (AVJ) to supplement production data with comprehension data within the same study. This task strictly tested the representation of P^V and V^P in preselected bounded and unbounded contexts in case these were avoided during narrative production.

5.1. Materials

In this task video-clips combined visual and aural information. Since the study focused on motion expressions that progress in space, the judgment task was designed to visually render movement. The video-clip is capable of capturing a motion event in its natural spatio-temporal flow, which can later be manipulated. Therefore, it is an ideal medium of contextualizing linguistically relevant information on path-boundedness. To encourage conceptualization of motion clips as bounded or unbounded, path-related information was overtly coded in video-action. In planned bounded contexts, the motion event visibly reached its spatial endpoint. In planned unbounded contexts, the video gradually disappeared from view when the moving object was at midpoint towards its spatial end-point.

The powerpoint contained 52 experimental slides repeating 26 different types of motion events. Each motion clip was approximately 4 seconds long. Each clip was shown twice, once presented in bounded and on another time in unbounded visual context. Next, a pair of Hungarian sentences was generated for each motion-clip. On one occasion, the same bounded motion-video was matched with the particle-verb ordering. Recall, this ordering implies bounded event description, and matches the planned bounded video. Therefore, this video-sentence pair was categorized as the bounded-matching condition. On the other occasion, the same bounded motion-video was paired with the verb-particle ordering. Recall, this ordering implies unbounded event description, so this was the bounded-unmatching condition. The same principle was applied to unbounded motion video-clips. Each sentence appeared with its audio file playing to control for prosody.

The motion-clips were embedded in an automated slideshow. Each slide read on the top Amikor a klipnek vége volt,... (‘When the clip ended …’) in Hungarian to anchor the interpretation of the motion videos in the past. This was done to match the past temporal frame of the narrative retell task. The slides transitioned after 14 second. During this time, each video played for 4 seconds before gradually disappearing over 0.5 seconds. At this time, the sentence appeared with its audio file. Learners had approximately 7 seconds to mark their judgments before the transition (2 seconds). The total time of the slideshow was 14 minutes.

In Figure 5, three frames capture how audio and visual information were integrated in the AVJ task for a [SLIDE] motion event. The motion expression of interest is made up of the spatial particle le (‘down’) and the past form of the motion verb csúszik (‘slide’). In Figure 5 (top frame, slide 4), the girl was sitting at the top of the slide when the video started to play, then she reached the bottom before the video disappeared from view. This animation was planned to encourage the bounded conceptualization of the [SLIDE] event. This video was matched with the particle-verb ordering (Figure 5, bottom left frame, slide 4), i.e. lecsúszott (lit. ‘down\slid’), to suggest bounded event description. Thus, slide 4 was
an example of the bounded - matching condition. Although slide 33 (Figure 5, bottom right frame) repeated the same video-action, it was paired with the verb-particle ordering as in the phrase csúszott le (lit. ‘slid*down’). Thus, it exemplified the bounded – unmatching condition. Slides were arranged so that the same motion-video would not appear in a sequence.

![Figure 5. Three frames exemplifying a planned bounded event paired with a P^V (lower left) and V^P (lower right) predicate to imply bounded and unbounded descriptions, respectively.](image)

5.2. Procedure

Learners completed this task on their own sitting at a computer. The slideshow started with the instruction slides and included four training slides in English to illustrate the task and the response format. Participants were asked to answer the question “Did the video clip match the sentence or not?” by circling judgments of YES or NO on an answer sheet. Then, the experimental slides started to play automatically.

NSs followed the same procedure as learners. However, after the prompt sentence appeared on the screen, they were given only 4 seconds to mark their judgment.
5.3. Predictions

It was predicted that participants will accept video-clips of spatially bounded motion clips paired with Hungarian sentences of the particle-verb predicate, and they will reject the same video-clips of bounded motion events when paired with Hungarian sentences of verb-particle predicate type. It was also predicted that participants will accept video-clips of unbounded motion events paired with Hungarian sentences of the verb-particle predicates, and they will reject video-clips of unbounded motion events paired with Hungarian sentences of particle-verb predicate type.

5.4. Results

The AVJ task was completed by 35 learners and 115 NSs of Hungarian. To match the presentation of results to that of the narrative task, I present the findings by the boundedness of the video, the variable manipulated in this task. Since the NSs served as a control group to assess the design, in addition to being the fifth proficiency group, I describe the results of this group first (Figure 6, right side).

![Figure 6. Acceptance rates highlighting the \( P^V \) orderings across bounded and unbounded contexts by proficiency.](image)

NSs’ acceptance rates of the \( P^V \) and \( V^P \) structures mirrored each other in both bounded (+b) and unbounded (-b) contexts, as expected (Figure 6). NSs accepted bounded video contexts paired with the prefixed particle-verb order (shown in black bar) at a much higher rate, i.e. 92%, than with post-verbal particle sentences (shown in white bar), i.e. 34%. Conversely, they accepted unbounded video contexts with the post-verbal particle sentences rather than with prefixed particles, i.e. 86% vs. 27%, and this was also expected. A repeated measures logistic regression model, with subject ID as subject effect and video ID as within subject effect, confirmed that boundedness was a significant predictor of NSs’ responses in both bounded contexts (Wald \( \chi^2(1)=306.423, \text{Bonferroni, } p<0.001 \)) and unbounded contexts (Wald \( \chi^2(1)=133.987, \text{Bonferroni, } p<0.001 \)). Taken together, acceptance rates within and across contexts mean that this was a successful elicitation.
Acceptance rates were also calculated for the learner groups and each learner. Such native-like contrast was found in Learner 9’s markings only. Statistical analysis confirmed that boundedness of video stimuli was a significant predictor of this learner’s judgments within bounded contexts ($\chi^2=11.631$, df=1, $p=.001$) and unbounded contexts ($\chi^2=4.073$, df=1, $p<.05$), as well as across contexts.

Although L2 learners were similar to NSs in that they also accepted both matching and non-matching stimuli, the same sharp contrast across contexts was not found in the learner groups in general. Some developmental trends were observable, though, by looking at acceptance rates within contexts. The upper black solid line in Figure 6 shows that the acceptance of prefixed particle-verbs in bounded context increased with proficiency. Learners in Group 0 accepted bounded matching stimuli at a rate of 55%, Group 50 at 71%, Group 80 at 77%, and Group 100 at 82%. At the same time, the acceptance rate of the same structure in unbounded context decreased from 56% in Group 0 to 42% in Group 100. This resulting gap is, at least, suggestive of emergence and development towards native-like contrast. This is indicated by the dotted lines that have been added based on Learner 9’s native-like contrast.

Figure 7 highlights the acceptance rates of $V^P$ forms, indicated by the white bars, across contexts. As explained before, NSs and Learner 9 showed a statistically significant association between $V^P$ structure and the unbounded context.

The solid lines in Figure 7 indicate the learner groups’ acceptance rates of the $V^P$ structure in bounded and unbounded video contexts. Recall, the expectation is that with increased proficiency, learners would show a growing association of this form with the unbounded context and a decrease with the bounded context, based on Learner 9’s production. What we notice here is that initially, there is a slight increase in the acceptance rate of this structure in both bounded and unbounded contexts. However, with increased proficiency the lines level off. In other words, there is no emergent gap for this structure across contexts, which is in contrast to the suggested emergence in bounded context.

In summary, the results obtained from the AVJ task suggest that form-meaning associations develop first in bounded contexts but lag behind in unbounded contexts.
6. Discussion and Conclusion

6.1. Interlanguage development

The study was designed to provide a fuller picture of L2 acquisition of boundedness than previous studies did. To appreciate the findings of the current study, it is important to recall what serves as evidence of acquisition in the domain of boundedness. Bardovi-Harlig (2005) states that “it is not until contrasts are possible in interlanguage that grammatical aspect becomes true viewpoint aspect” (p. 399). The data from Learner 9’s performance on the production and recognition tasks provided clear evidence for native-like knowledge of verbal particles as boundedness markers in Hungarian. These results confirm previous findings from L2 tense-aspect comprehension studies that demonstrate a growing association of prefixed particles with aspect-marking and ultimate attainment of native-like representation (Kozlowska-MacGregor, 2005; Montrul & Slabakova, 2001, 2003; Slabakova, 2000, 2005; Slabakova & Montrul, 2002, 2007).

In addition, though, this study also informed us of how learners are able to express meaning by drawing on their existing linguistic repertoire during interlanguage development. Although L2 learners (with the exception of Learner 9) did not exhibit context-driven production nor comprehension of expected structures across the tasks, they displayed sensitivity to boundedness, which is key. In the early stages of development, as shown in the narrative task, learners employed reduplicated forms, a previously unreported finding in L2 tense-aspect research. These form-meaning associations were unique and unexpected but, at the same time, they served the learner’s communicative goal to signal the bounded-unbounded semantic contrast.

The prefixed particle-verb structure was produced in both contexts while the verb-particle structure was produced in very low tokens and learners accepted and rejected the latter form in both contexts at similar rates. These findings jointly confirm the form-before-meaning principle (Bardovi-Harlig, 1992) that claims that in early stages of acquisition learners will use morphological forms without controlling their distribution. The reported asymmetry between the production and comprehension of the structures is also in line with previous studies that claim late emergence of the imperfective relative to the perfective (Bardovi-Harlig, 2005; Gabriele, Maekawa, & Alemán-Bañón, 2009; Slabakova & Montrul, 2002, 2007).

Based on the corpus of this study, the following developmental pattern is proposed. First, the particle-verb predicates are unspecified with regards to boundedness. At this early stage the bounded-unbounded contrast is encoded between simplex and reduplicated predicates. Later, most probably linked to the expansion of the learners’ vocabulary of motion verbs, L2 learners may acquire a grammar-based contrast. The latter is hypothesized based on the competence of Learner 9.

The contributions of this study to our current understanding of L2 acquisition of boundedness arose from the fact that learners responded differently to the two tasks and, on the judgment task, their responses were also different from that of NSs’. The facilitative effect of the current design is discussed below.

6.2. The significance of task design

This study showed that task effect can be exploited favorably in L2 acquisition research when proper controls are in place. NS judgments confirmed that a study of boundedness involves subjectivity through conceptualization. This showed in the acceptance of non-matching stimuli across contexts. This result, however, is compatible with previous research conducted with NSs (van Hout, 2008) and shows the importance of controls in studies of boundedness. Had the judgment test been chosen as the sole means of L2 assessment, though, development would not have been captured. It was the narrative production task that revealed purely interlanguage forms (Bardovi-Harlig, 2013). The findings clearly show the need for combining elements from both the formalist and functionalist approaches.

A crucial design feature of the two tasks is that they overtly presented linguistically relevant boundedness-related information through visualization. Since this study focused on motion events, it was fundamental to emphasize movement in the stimuli. Unlike previous tense-aspect studies that relied on written scenarios or pictures to elicit judgment markings, the audio-visual judgment task developed
here introduced an innovation by incorporating real-time motion-action clips. This is an authentic and direct mode of presenting movement, and its significance was confirmed by statistical analysis. By choosing the visual design, the audio-visual task has established a unique relationship between the conceptualization of the event and the corresponding linguistic form. This made the judgment task a purely comprehension-based element. The effect of visualization in the narrative task showed prominently in the elicited interlanguage forms. While previous tense-aspect studies utilizing the narrative relied on wordless picture-books, the current study further enhanced this stimulus type by elaborating scenes and elongating paths. In other words, the enhanced narrative had the capability to elicit both target structures, as attested in the production of one learner, and this control was crucial in inviting the encoding of contrastive viewpoints from all learners. Thus, this design addressed the call for studying the imperfective in planned contexts and not merely as a “by-product of perfective” in the narrative (Bardovi-Harlig, 2005, p. 413).

The path manipulations in both tasks also allowed for the balanced elicitation of target linguistic forms and interlanguage forms. The two tasks complemented each other by exploring how form-meaning connections evolve from different directions. The audio-visual judgment task investigated the mapping of form to meaning for two pre-selected structures across the learner and NS groups. The analysis of NS judgments provided statistical evidence for the sound design of this task. In contrast, the narrative task asked participants to map meaning to form, which elicited not only the structures that were tested in the audio-visual task but also additional, unpredicted forms. This is further evidence that two tasks can provide complementary information on L2 development.

The audio-visual task provided essential support for the proposed trajectory of interlanguage development. The narrative elicited mainly prefixed-particle structures and its reduplications. However, it elicited only occasional tokens of the expected verb-particle predicates, which would not allow for making any developmental claims about these structures. The audio-visual task, though, has been able to reduce the production bias towards encoding endpoints by providing balanced opportunities for evaluation. It also confirmed that learners in the narrative text did not simply avoid the production of the verb-particle structure. Rather, they most probably did not produce it because they also did not recognize it as a single structural unit that encodes boundedness.

These findings of task effect suggest that for an investigation into the L2 development of form-meaning association, in the domain of boundedness at least, a single methodology alone is not sufficient. Across tasks, the results showed coherent patterns distinguishing learners by proficiency. These results are taken to support the claim that the tasks employed here collectively provide a reliable and valid measure of L2 knowledge and, arguably, they both access implicit knowledge. This shows in the meaning-oriented nature of the two tasks and the strict control of time and structures in the audio-visual task (Ellis, 2009). The narrative, on the other hand, may be perceived as a relatively freer type of production task. However, the learners had to tell their story to an audience without a verbal rehearsal, making this task more similar to a spontaneous production task that accesses implicit knowledge.

6.3. Implications for future studies

Looking ahead, the findings show that pairing the narrative and the visual judgment task would lead to the strongest possible description of L2 knowledge. Although this work examined boundedness in the spatial domain, current design could inform future L2 tense-aspect studies. Future work should test different combinations of tasks across the formalist and functionalist paradigms and explore the use of visual controls in studies of temporality. This study offered picture serialization for designing production tasks and animation for designing comprehension tasks. This is a progress from previous studies that employed static pictures in an attempt to visualize events.

Current results also confirm the need to elicit production data from NSs. For example, the targeted verb-particle order was produced by learners in low tokens but recognized by Hungarian NSs in unbounded contexts consistently. It would be interesting to see whether the visual controls prompt the production of this structure from NSs. The fact that learners used reduplicated forms also raises the possibility of NSs using similar forms. If so, then the question is which reduplicated structures would they produce? Conversely, the audio-visual task may be modified to include motion-videos paired with
sentences that use reduplicated predicates, i.e. predicates produced by the learners. Such a design could be presented to NSs and investigate whether NSs systematically associate reduplication with unbounded meaning, and thus it may further inform us of the overall communicative value of these forms.

Finally, previous studies following either the formal or functional approach have tested different learner populations. Although learners may be asked to perform multiple tasks as part of the same study, such procedures may still question the comparability of findings. This study, though, analyzed data obtained from the same learners across tasks, which may further strengthen the claims presented here. However, it is for future studies to explore whether this is a necessary control in addition to the visual design elements.

References


