Article:
Vanek, Norbert orcid.org/0000-0002-7805-184X and Mertins, Barbara (2019) Defying chronology::Crosslinguistic variation in reverse order reports. Linguistics. pp. 1-35. ISSN 0024-3949

https://doi.org/10.1515/ling-2019-0006

Defying chronology:

Crosslinguistic variation in reverse order reports*

NORBERT VANEK AND BARBARA MERTINS

Abstract

Much of how we sequence events in speech mirrors the order of their natural occurrence. While event chains that conform to chronology may be easier to process, languages offer substantial freedom to manipulate temporal order. This article explores to what extent digressions from chronology are attributable to differences in grammatical aspect systems. We compared reverse order reports (RORs) in event descriptions elicited from native speakers of four languages, two with (Spanish, Modern Standard Arabic (MSA)) and two without grammatical aspect (German, Hungarian). In the Arabic group, all participants were highly competent MSA speakers from Palestine and Jordan. Standardised frequency counts showed significantly more RORs expressed by non-aspect groups than by aspect groups. Adherence to chronology changing as a function of contrast in grammatical aspect signal that languages without obligatory marking of ongoingness may provide more flexibility for event reordering. These findings bring novel insights about the dynamic interplay between language structure and temporal sequencing in the discourse stream.

*Corresponding author: Norbert Vanek, Centre for Research in Language Learning and Use, Department of Education, University of York, York YO10 5DD, UK, E-mail: norbert.vanek@york.ac.uk

Barbara Mertins, Institut für deutsche Sprache und Literatur, Fakultät Kulturwissenschaften, Technical University of Dortmund, Emil-Figge Strasse 50, 44227 Dortmund, Germany, E-mail: barbara.mertins@tu-dortmund.de

1. Introduction

How do speakers tackle the mismatch between complex event representations in their knowledge base and the need to linearly order language units that spread over time? Preverbal planning of upcoming discourse segments brings the need to cluster series of coherent information units and to establish their relative order. The ways in which such units are typically configured constitute an essential source of memorised knowledge, known as *scripts* (Schank and Abelson 1975), *story schemata* (Brewer 1984), *structured event complexes* (Wood and Grafman 2003), or *sequential event structures* (Carota and Sirigu 2008). These help speakers to select the initial event and to order the subsequent units in the stream of discourse. From simple events (*making a sandwich*) to more intricate ones (*making peace*), speakers often relate individual event components to each other in accordance with the steps they stereotypically follow as they unfold in time. Such synchronisation is helpful for the development of shared standards about routinised sequences, which enables a swift interpretation of similar events encountered at a later point (Burt et al. 2000), and it also facilitates decoding for the listener. Arranging information for expression in line with the *principle of natural order* (Clark 1974, Labov 1972, Levelt 1989), also known as *principle of iconicity* (Chafe 1979, Givón 1992) or *principle of isomorphism* (Ohtsuka and Brewer 1992), may be crosslinguistically the default choice, however, languages provide speakers with ample manoeuvring space to digress from chronology (Levinson 2000). Here we focus on comparing features of reversed order in narrative discourse that are more language-independent (the relationship between order reversal and serial position) with aspectual features that are more language-specific (non-aspect languages typically shifting narrative time vs. aspect languages typically keeping narrative time iconic).

When narrating a story, the order of events in real time assists us to build conceptual knowledge that we use to track and dynamically update our discourse-level representation of evolving event chains. Psycholinguistic evidence suggests that we tend to anchor upcoming

discourse segments to temporally and textually recent information (Simner et al. 2003), and that our perception, expression, and also memory of events are to a great extent guided by patterns of real world activity in a stimulus-driven fashion (Burt et al. 2000, Zacks et al. 2001). Our preference for forward serial order is strong. We know it often persists even in those memory retrieval tasks which do not require chronological sequencing (such as free recall tasks, e.g. Bhatarah et al. 2009, Lewandowsky et al. 2008, Ward et al. 2010; and comprehension of narratives with temporal flashbacks, e.g. Claus and Kelter 2006, Kelter and Claus 2005). Inclinations to maintain chronological order can be expected when we consider that they bring a number of advantages. One of them is an easier decoding process for the listener because forgotten event components can be substituted by alternative plausible segments which help to maintain the logic of the given sequence (Burt et al. 2008). Also, selecting the temporally most recent expression as the anchor for the subsequent proposition reinforces local coherence (van den Broek et al. 2000), it facilitates the processing of causality (Briner et al. 2012), it can be faster and more strongly integrated into readers' situational representations (van der Meer et al. 2002), it is remembered with higher precision in subsequent recall (Clark and Clark 1968), and it makes message planning in discourse production easier compared to a reliance on remote antecedents that fade faster in short-term memory (Simner et al. 2003). Given these advantages, it is not surprising that temporally isomorphic narratives are found typologically more common (Greenberg 1963). What differs though, are the means different languages use to facilitate isomorphic interpretations. Previous research in this area (Schmiedtová 2004) showed that in video retellings of aspect language speakers (English, Czech), two perfective verb forms in adjacent clauses suffice to express sequentiality rather than simultaneity (e.g. *the flames flare up and a man walks past*), while non-aspect language speakers (German) cannot rely on grammatical means for aspectual disambiguation so they typically employ lexical devices instead (*the flames flare up/are flaring up and then a man walks/is walking past*). Empirical explorations attempting to bridge the potentially more language-specific with the arguably more universal level of reverse order representations are currently lacking. This article aims to fill a fraction of that

research gap by investigating the possibility that, alongside language-neutral commonalities characterising information ordering (chronology more strongly adhered to in episode-initial clauses that serve to set the scene), there is language-specific influence attributable to grammatical aspect as a result of its potential to modulate sequencing preferences in discourse.

Sequencing that does not conform to chronological order arises in response to daily communicative needs, and it requires that speakers and listeners perform backward computations. The absence of marking digressions from chronology (frequent in early learner varieties, e.g. Bardovi-Harlig 1994, Klein 1984, Schumann 1987) is communicatively hazardous because in such cases the intended event order remains unknown to the listener. One example of when the information flow does not echo the sequence in which events naturally occur is *topicalisation* (i.e. mentioning the most salient event first, as in *the car broke down and she bought it just a week ago*). Another example of non-chronological event mention is *backgrounding* (i.e. when a non-chronologically expressed event serves the discourse function of providing background details that explain or elaborate the state of affairs mentioned earlier, as in *Max slipped. He spilt a bucket of water.* (Lascarides and Asher 1993, ter Meulen 2000)). There is evidence from neurolinguistic studies showing that digressions from chronological order in discourse incur additional computation costs, which are detected in listeners from 300 ms after reversing the real time order in the verbal input (Münte et al. 1998) and in speakers already from 180 ms after the onset of a vocalisation prompt that channels focus away from chronology (Habets et al. 2008). In comprehension, when listeners hear bi-clausal event descriptions that are linked neither causally nor logically (e.g. *before/after the chameleon caught the grasshopper, the rainbow disappeared*), Münte et al. (1998) found progressively greater negativity in ERP responses to 'before' sentences which signal reverse order. The different response pattern was attributed to added demands for forming discourse-level representation of a sentence initiated by a reverse order prompt. Without a reverse order prompt (using e.g. event triplets instead), recent evidence suggests that it is the frontal P600 which shows greater sensitivity to temporal order violations than the N400 (Drummer et al. 2016). In production, Habets et al. (2008) reported

similar sensitivity to order reversal when participants were colour-cued to build non-chronological constructions from a sequentially presented pair of drawings (e.g. red cross=*before the polar bear entered the igloo, the hunter fell over*) compared with preserving chronology (e.g. green cross=*after the hunter fell over, the polar bear entered the igloo*). During the preverbal message generation stage, the increased negativity recorded in the process of constructing a reverse order report (ROR) paralleled results from comprehension (Münte et al. 1998), which together suggest that serial and reverse structures vary in memory load when we create a temporary representation of a sentence. Converging evidence for increased processing costs incurred when the reported order does not match chronological sequences also comes from longer reading times (Mandler 1986) and slower as well as less accurate decisions about the underlying event order (Baker 1978). Nevertheless, advantages linked to chronological ordering have also shown their limits. Examples when no advantage was found include decisions about input order in stories containing flashbacks (Baker 1978) and reading speed (self-paced) when the temporal connectives (*before/after*) were placed in the second clause rather than the first (Hoeks et al. 2004). Despite substantial advances in our current understanding of principles that guide order reversal, the crosslinguistic dimension of how grammatical aspect in different languages contributes to event linearization is still underresearched.

2. Background

2.1 Grammatical aspect and narrative processing

The relevance of reverse order in language propels the question how speakers' representations of narratives are modulated by temporal operators. Our concern here is grammatical aspect, which acts as a key operator known to constrain mental representations in narrative processing (Becker et al. 2013, Bergen and Wheeler 2010, Ferretti et al. 2007, 2009, Flecken and Gerwien, 2013, Madden and Zwaan 2003, Magliano and Schleich 2000). Previous within-language explorations in the comphrehension domain showed that variations in grammatical aspect

channel the construction of situation models in significantly different ways across larger stretches of discourse. For instance, Magliano and Schleich (2000) asked English native speakers to read stories in which the critical activity of the first sentence was marked either as in progress (*Mark was landing the plane*) or as completed (*Mark landed the plane*). The next three sentences were constructed in a way that allowed both concurrent and sequential interpretation with the critical situation. Participants saw a verb phrase (e.g. *land the plane*) either straight after the critical sentence or following the three subsequent sentences, and their discourse representations were tested via reaction times incurred during verifications (click yes/no) whether the situation expressed by the given verb phrase had appeared in the text earlier or not. Results showed that situations marked grammatically as ongoing were identified significantly faster than those marked as completed, and this was the case both immediately after the critical sentence as well as in the delayed anaphoric condition. Grammatical aspect clearly influenced the activation of information and its retrieval from memory. One plausible interpretation that the authors provide is that marking of situations grammatically as in progress provides important processing cues that highlight the continuity of relevance when comprehenders form mental representations, and these are retrieved with greater ease than situations marked as completed because the latter "must be either updated or abandoned to construct a new situation"(Magliano and Schleich 2000: 108). If we accept that grammatical aspect markedly influences formation of mental structures in discourse, it still remains to be tested how different aspectual operations relate to serial vs. reverse ordering.

In the production domain, several lines of inquiry have been pursued to test how grammatical aspect systems in different languages modulate processes involved in retrieving event information from the knowledge base. The language combinations examined to date include Czech and Russian (Schmiedtová and Sahonenko 2008); Dutch, English and German (von Stutterheim et al. 2009); Czech, English and Hungarian (Vanek and Hendriks 2015); Japanese and German (Tomita 2013), Swedish and Spanish (Bylund 2011). Analyses of video retellings showed that speakers of languages with the concept of ongoingness fully grammaticalised in

their aspect systems (e.g. English, Russian, Spanish) are more strongly drawn to the internal structure of the events (see evidence also from eye-fixations, e.g. von Stutterheim et al. 2009) so they tend to express events as in progress and typically without explicit reference to temporal boundaries (*two nuns were walking on the pavement*). Speakers of languages with no grammatical aspect (German, Swedish, Hungarian), and speakers of languages that do not equip their speakers with a regularised ongoingness marking system (Czech, Japanese), show preference to view events holistically and more often include endpoints in their verbalisation (*two nuns walked to a cloister*). These contrasts signal that the construction of temporal frames within which the developing situation model is mapped onto linguistic forms for expression are sensitive to crosslinguistic differences in grammatical aspect.

The impact of aspectual differences in larger stretches of narrative discourse was found to manifest itself as *anaphoric shifting* characteristic for non-aspect language speakers and as *deictic anchoring* typical of narratives produced by aspect language speakers (Carroll and von Stutterheim 2003, Vanek and Hendriks 2015). *Deictic anchoring* is defined as a way of establishing temporal coherence in discourse by expressing events as ongoing and keeping their time constant with the utterance time (e.g. *the ants are forming a raft and are floating to the other side of the puddle*). This differs from *anaphoric shifting,* which is defined as a linkage of events in discourse by means of temporal shifts from one (sub)event to the next, independently from utterance time (e.g. *the ants form a raft and then they float to the other side of the puddle*). Although relatively little is known about how event ordering choices interact with specific temporal frames, results of an exploratory study comparing Czech, English and Hungarian narratives (Vanek 2013) indicate that progression in the story line built on anaphoric shifts (e.g. *the ants floated to the other side of the puddle after they formed a raft*) may provide more flexibility for temporal reordering because of significantly more frequent explicit marking of event boundaries (*after that, later, then, before, whereupon)*. Such signposts can serve as important processing cues that help to maintain transparency about the direction in the temporal information flow when events are not expressed chronologically. Deictic anchoring, in contrast, is more likely to act as

processing instruction to align conceptual event order with the unidirectional forward flow of the utterance time, a claim which will be elaborated in the next section. Within the wider research context of production studies investigating grammatical aspect and its influence on the expression of temporality (e.g. Klein 2009, von Stutterheim et al. 2012), the crosslinguistic aim of this work is to shed light on the yet elusive relationship between temporal organisation principles (anaphoric shifts in non-aspect languages vs. deictic anchoring in aspect languages) and freely recalled event order in narratives.

2.2 Ordering internally-focused versus boundary-focussed events

The main motivation for this study is to test the prediction that the order of mention during free verbal recall closely interacts with the presence or absence of a grammatical marker for ongoingness in the language of verbalisation. The rationale for this prediction is that grammatical aspect highlights and activates either situation-internal or boundary-focussed event features (Ferretti et al. 2007, Magliano and Schleich 2000), which in longer stretches of discourse may facilitate the emergence of two different ordering patterns. Relatively stronger adherence to chronology can be expected for deictic anchoring, when situation-internal features are in focus. Events expressed as ongoing (in aspect languages typically via imperfective structures) are linked to the utterance time, which limits their mobility in the narrative because utterance time can only proceed in forward direction. Conversely, more frequent digressions from chronology can be expected during anaphoric shifts, i.e. when event boundaries are in focus. When speakers construct narratives using boundary-focused events (in non-aspect languages typically via positional time adverbs), their completion points present arguably more reliable anchors which may facilitate navigation of the upcoming discourse segments in both backward and forward direction.

To investigate the possible interactions between diverse grammatical aspect systems and temporal order manipulations in discourse, a distinction is drawn between *event structure*, i.e.

information about situations stored in the knowledge base, and *discourse structure*, i.e. temporal arrangement of activated conceptual information that is expressed in the narrative (Ohtsuka and Brewer 1992). Regarding the analytical framework for temporal reference, the Basic Time Structure (BTS) model (Klein 1994, 2009) is adopted as it enables language-neutral unbiased comparisons. Within the BTS, the temporal properties expressed via grammatical aspect are defined on the basis of how *topic time* (TT, i.e., the time span for which the assertion is made via linguistic means) is related to *situation time* (TSit, i.e., the time for which the situation holds true). In the earlier example of anaphoric shifting (*the ants form a raft*), the TT1 of forming a raft includes the completion point (and possibly part of the post-time of raft formation), which is followed by an explicit shift into the subsequent TT2 of floating across the puddle and with the inclusion of the given completion point (*and then they float to the other side of the puddle*). When consecutive events are anchored deictically, TT1 as well as TT2 are fully included in the corresponding TSit (*the ants are forming a raft and are floating to the other side of the puddle*), the internal structure of the event is highlighted, and temporal boundaries remain out of focus. Based on this difference, the crosslinguistic core of this investigation is to test the prediction that narratives produced in aspect languages in which temporal progression typically relies on a deictic anchor do not combine with reverse order reports as readily as non-aspect languages do. In other words, projected backwards, the rationale for narratives in non-aspect languages to exhibit more digressions from chronology is built on the idea that when discourse structure progresses by means of anaphoric shifts (viewing events from the outside signaled by using explicit temporal boundary markers), reversing the temporal order will be easier and thus more frequent that in aspect languages.

On the more language-universal level, we were interested in examining whether adherence to chronology varies across serial positions, with markedly fewer order reversals in the initial components of an event sequence. This hypothesis is based on the observation that events occurring close to episodic starts in narratives usually construct the setting (e.g. Berman and Slobin 1994, Carroll and von Stutterheim 2003) and we therefore predict that episode-initial

events are less likely to be displaced than events occurring later in the episode. One plausible reason is that displacement of early components essential for the setting is a greater communicative hazard as it could more easily distort the plot. In this study, each event was assigned an episodic serial number corresponding to its position in the video stimulus, and we measured how digressions from chronology relate to where they occur in each verbalised sequence. We also tested another, perhaps a more general principle that ordering elements of language in discourse is generally *isomorphic* (Ohtsuka and Brewer 1992) aka *iconic* (Chafe 1979, Givón 1992) to the underlying event structure, i.e. that discourse linearization more typically mirrors the stimulus order than diverts from it.

2.3 Grammatical aspect features in the tested languages

In Hungarian, grammatical aspectual marking of ongoingness is absent (Takács 2012), and simple verb forms can have both perfective and imperfective readings (as in *vádat emeltek (AMBIV) a kutyái nélkül költöző nő ellen* 'they prosecuted/were prosecuting the woman who moved/was moving without her dogs'). Typically, durative vs. punctual adverbials assist with aspectual disambiguation of simplex verbs (as in *éppen(*IMPERF) *vádat emeltek* 'they were prosecuting at that time', *rögtön*(PERF) *vádat emeltek* 'they instantly prosecuted') (e.g., Kiefer 2006). Ongoingness can be marked in complex verbs (coverb + simple verb such as *visszahív* 'call back') by positioning the coverb postverbally (Abondolo 1998: 445) (e.g. *amikor a munkaadó hívott vissza* 'when the employer was calling back').

German is also a non-aspect language (Thieroff 1992). Grammaticalised expression of reverse order is limited to tense morphology (Fabricius-Hansen 2006). Some German dialects (e.g., die rheinische Verlaufsform) provide the option of expressing ongoingness through the use of periphrastic constructions (*bei*/*am* 'at the' + verbal noun; as in *Eine Frau ist am Stricken* 'a woman is knitting (at-the knit)' or *dabei* 'there-at' + *sein* 'to be' + INF; as in *Jemand ist dabei das Brot zu schneiden* 'someone is cutting bread'), however, these constructions represent highly

marked choices constrained to a small number of events, verbs and contexts, and do not appear in the dataset analysed here.

Spanish obligatorily encodes grammatical aspect in the past tense to express the PERF-IMPERF contrast (Ayoun and Salaberry 2005). Aspect and tense in Spanish are merged in the same morpheme, e.g. in *corrió* 'ran' the morpheme *–ó* marks past tense as well as perfectivity that signals completion of the running event, and in *corría* 'was running' the morpheme *–ía* expresses pastness as well as an internal perspective on the running event (Hodgson 2003, Salaberry 2003). With respect to functional use in narratives, the imperfective (as in *el hombre iba(IMPERF) a un restaurante* 'the man was going to a restaurant') is typically used to signal backgrounded information and evaluations, while the perfective (as in *el hombre fue(PERF) a un restaurante* 'the man went to a restaurant') typically occurs in foregrounded events which shift narrative time (Hopper 1979, Silva-Corvalán 1983).

In Modern Standard Arabic, finite verbs receive obligatory marking for aspect (Owens and Yavrumyan 2007). The perfective form, used to express a change of topic time, is suffixed (as in *fataḥat l-ʔummu n-nāfiḏa* 'the mother opened the window') while the imperfective form, used to express a subinterval of an ongoing situation, is prefixed (*taftaḥu l-ʔummu n-nāfiḏa* 'the mother is opening/opens (habitually) the window'). The PERF-IMPERF opposition is complemented by a third aspectual form, the active participle (AP). In spoken Arabic (Levantine/Palestinian variety/from multiple cities), AP is used to express a resultative meaning in accomplishment-type verbs (*rāğel ḥāll l-karhba* 'the man has opened the car') as well as in activity-type verbs (*rāğel rāged 'a l-ḥšīš* 'a man has (fallen) asleep, and is therefore sleeping on the straw') (examples from von Stutterheim et al. 2017). Aspect use in Arabic narratives also closely relates to grounding, with the past imperfective (as in *kāna r-rajulu yaḏhabu(IMPERF) ʾilā l-maṭʿam* 'the man was going to a restaurant') often used for backgrounding, and the perfective (as in *ḏahaba(PERF) r-rajulu ʾilā l-maṭʿam* 'the man went to a restaurant') for foregrounding (Khalil 2000).

It is important to consider anaphoric shifting and deictic anchoring as language-modulated discourse organisational preferences rather than strict rules, and there is no rule which would prevent deictic anchoring in the absence of imperfective marking (e.g. in Hungarian *miközben futottunk (állandóan) panaszkodott* 'while we ran/were running he complained/was complaining (all the time)'). Also, the two aspect languages in this study may be viewed as typologically distinct, varying in a number of features, but they share an important property that justifies their grouping. Spanish uses a progressive marker (not obligatory) to express ongoingness while MSA encodes ongoingness via imperfective aspect morphologically. Unlike for the progressive, the use of imperfective forms in some languages can also entail inclusion of an event's right boundary (e.g. in Czech, Schmiedtová 2004). However, both Spanish and Arabic speakers were found to habitually relate event time to utterance time in narratives (i.e. to decompose events into phases) (e.g. von Stutterheim et al. 2012), which is a key shared dimension that ROR analyses can build on.

2.4 Research questions and hypotheses

RQ1: On the crosslinguistic level, how does the presence or absence of grammatical aspect interact with event ordering during free verbal recall? To what extent does the strength of adherence to chronology differ in discourse characterised by anaphoric shifting vs. deictic anchoring?

H1: Event ordering during free verbal recall will closely interact with the presence or absence of a grammatical marker for ongoingness in the language of verbalisation. More frequent digressions from chronology are expected to occur in non-aspect languages than in aspect languages. Stronger adherence to chronology is predicted for deictic anchoring than for anaphoric shifting.

RQ2: On the language-neutral level, do reverse order reports predictably vary across serial positions? Are episode-initial events less likely to be displaced than events occurring later? And is event ordering generally isomorphic, i.e. does it typically follow the stimulus order?

H2: Fewer reverse order reports are expected across languages for episode-initial positions than for later positions in event sequences. Event linearization is predicted to mirror the stimulus order more often than to divert from it.

3. Method

3.1 Participants

Eighty adult individuals with either German, Hungarian, Arabic or Spanish as their clearly dominant language (N=20 native speakers per group, all university-aged students from comparable socioeconomic backgrounds) agreed to retell the *Quest* animation episode by episode. All groups were gender-mixed (N_{ARB}=4, N_{SPA}=11, N_{HUN}=12, N_{GER}=10 females). Their spoken responses were recorded offline, i.e. after each episode. Each participant was tested in their native language context. None of the participants considered themselves fluent in any language other than their native language. All interactions and instructions before and during testing were restricted to the participants' native language (MSA in the Arabic group). In the retellings, the standard variety of each of the four languages was used even though regional origins of the German, Hungarian and the Spanish participants varied. Heterogeneity of regional distribution was lowest in the Arabic group. All Arabic participants were from either Palestine or Jordan, and used the Levantine variety of their native language in everyday life, however, they used Modern Standard Arabic in a university context as well as during the film retellings. In our study, at the time of testing all Arabic participants had a high active spoken competene in MSA and exhibited no difficulty in tense nad aspect use.

Considering the aims and background of the study, the comparability of narrative skills was checked by calculating the number of events expressed within the 'non-aspect language' groups [German, Hungarian] vs. the 'aspect language' groups [Arabic, Spanish] (see Table 1 for details). An ANOVA including a planned aspect/non-aspect contrast returned a non-significant difference

between the two language pairs $t(76)=1.591$, $p=.116$, which was interpreted as a signal of comparable event retelling skills of speakers in the aspect vs. non-aspect language groups.

3.2 Materials

A coloured non-verbal animation with the total duration of 07'05", total bitrate of 1924 kbps, and played at 25 frames per second was used to elicit verbal responses in each of the four languages. The title of the animation is *Quest©* (Montgomery and Stellmach 1996). A video extract for illustration is available at http://stellmach.com/Webseiten/Quest/Quest_excerpt.html. The video was provided for data elicitation purposes by the research team of Christiane von Stutterheim at the University of Heidelberg. The event flow builds a coherent story which revolves around a single protagonist (the sandman) who transitions through five imaginary worlds in search for water and encounters difficulties in each. Episodic boundaries are defined by the exact length of time the protagonist spends in the given imaginary world (episode 1 *'Sandworld'* 00'00"-01'17", episode 2 '*Paperworld*' 01'18"-02'27", episode 3 *'Stoneworld'* 02'28"-04'28", episode 4 '*Metalworld*' 04'29"-06'25", '*Quest completed*' 06'26"-07'05"). Each episode is a collection of various temporal relationships between event components, including simultaneous, fully sequential and partially overlapping event units. Importantly, speakers were guaranteed sufficient freedom to decide on the temporal order for expression, depending on what they considered communicatively optimal in order to accomplish the set task.

3.3 Procedure

The film retelling task was administered with the assistance of a video player software and a dictaphone. Each retelling was preceded by a brief language background-related interview and an expression of consent. Participation was voluntary and remunerated, the recordings and

transcriptions were anonymised. It took participants around 20-25 minutes to complete the task, the interview and the consent form.

The instructions for the participants were to watch the animation carefully and to retell the events during the pauses after each of the five episodes. Individually recorded participants were encouraged to reproduce the events in a way that a listener could imagine the events as clearly as possible only on the basis of the retelling. No time limit was imposed at the retelling stage. As the events were retold offline, participants first needed to process information from the visual input, store the event order in memory, and subsequently reactivate the flow of event stimuli during verbal recall. Episodic division aimed to reduce memory load in order to ensure higher comparability of the event segmentation degrees between and within groups, and to preserve a rich active representation that retellings could build on. The digitally recorded narratives were transcribed, and each propositional unit was coded for temporal order and aspectual status by a native speaker coder for each language group.

Data analyses are based on 100% of the transcripts of the four groups. There were two rounds of coding, a main round and an inter-rater agreement check. First, all data were coded for RORs by four native speakers, one speaker per language. Second, 20% of the transcripts from each language group were randomly selected for a second round of independent ROR coding by four different native speakers. Double coding of a fifth of the data served to ensure that the chance of coding errors was minimised. Each of the eight coders was blind to the hypothesis of the experiment. Inter-coder reliability was high, over 82.5% ($K > .8$) for each of the four pairs of coders. Initial discrepancies in coding were either resolved through discussions, or if disagreements remained (< 2%), the RORs in question were excluded from subsequent analyses. ROR frequencies based on gender did not differ significantly within any of the four groups.

3.4 Coding

Forward and reverse order reports were identified in the linguistic production of each of the 80 participants. The order of events presented in the stimuli served as the comparative baseline. RORs included digressions from chronology that were in the form of reference to earlier events within the same episode or to events in previously seen episodes. The coding distinguished within-episode cases from between-episode cases, and it also captured information on whether a non-chronologically ordered event was expressed earlier, in a chronologically proper position (Table 1). Meta-communicative comments in the form of propositions marking the narrator's viewpoint (e.g. *the camera pans out*, *in the background we can see*) were excluded from ROR analyses. Two adjacent propositions may represent simultaneously unfolding events based on world knowledge inferences of the participant (*the river flooded the zoo and the animals panicked*), however, the coded order was consecutive or reverse in strict adherence to event timings in the stimulus sequence. The coding of propositions followed Levelt (1989) and Berman and Slobin (1994), separating each conceptual units that minimally includes reference to a situation (a predicate + reference to modality and optionally to time, space) and includes one finite verb (verb compounds=one proposition). Those propositions which lacked a finite verb (e.g. *just like before the escape*) were counted together with the nearest finite verb as a single proposition.

To test whether higher ROR frequency is attributable to differences in aspectual systems rather than to individual variation of event partitioning, a standardised ROR index (i.e. the percentage of propositional units that are classified as RORs) was calculated for each participant. An important point when coding RORs was an awareness that the discourse stream of participants can reflect segmentation of two different kinds (Carota and Sirigu 2008), i.e. along a vertical axis (making a bed ↓ putting on the sheet ↓ pulling the sheet over the top of the bed) as well as horizontally (spreading out the blanket → straightening it → pulling the sheet over the top → straightening it out → lifting the bed up → tucking in the blanket; examples from Zacks and Tversky 2001: 38). The analyses here included all RORs that emerged both within the same level

of segmentation (two non-chronologically ordered micro events) and also across different levels (one macro event + one micro event ordered in reverse).

Six ROR types were distinguished according to the linguistic marker used to express them. These types included (a) tense/aspect contrasts, (b) relative clauses, (c) complements, (d) *because* clauses, (e) single temporal adverbials, and (f) dual temporal adverbials (Bardovi-Harlig, 1994). Identifying the latter five types followed the same criteria across languages, however, the coding of RORs marked with tense/aspect contrasts was sensitive to crosslinguistic differences (in addition to grammatical tense marking in all four languages, perfective/imperfective aspectual contrasts were coded in Spanish and Arabic). If a ROR was double-marked with two different linguistic means (e.g. via tense contrast + relative clause), it was entered in the counts only once. All double-marked RORs (N_{ARB}=1, N_{SPA}=4, N_{HUN}=4, N_{GER}=3; 100% double-marked with tense/aspect + other) were grouped in the tense/aspect category.

Example reverse order reports representing the six categories of linguistic marking:

1) ROR without explicit marking (English translation equivalents of the examples from the four languages)

ENG: He **is frustrated**, he **made** a big mistake.
ARB: Innahu **munza'ij**, laqad **irtakaba** xata-an kabiiran.
SPA: **Está frustrado**, **cometió** un error muy grande.
GER: Er **ist frustriert**, er **machte** einen grossen Fehler.
HUN: **Nyugtalan**, nagy hibát **követett e**l.

2) ROR marked with a single temporal adverbial

ENG: The man **started to search** for water **after** he woke up.
ARB: **Bada-a** ar-rajulu **bil bahth** 'an maa-an ba'd an istayqad.
SPA: El hombre **empezó a buscar** agua **después de** que se despertó.
GER: Der Mann **begann** nach Wasser **zu suchen**, **nachdem** er aufwachte.
HUN: Az ember **elkezdett** a vízforrás után **nyomozni miután** felkelt.

3) ROR marked with dual time adverbials

ENG: His behaviour **instantly** changes **when** the walls move closer.
ARB: Taghayyara taṣarrufuhu **farwan 'indama** qtarabat al-judraan.
SPA: Su comportamiento cambia **en el momento en el que** las paredes se acercan más.
GER: Sein Verhalten verändert sich **sofort**, **wenn** die Mauern näher kommen.
HUN: A viselkedése **rögtön** megváltozik **amikor** a falak egymáshoz közelednek.

4) ROR marked with a relative clause

ENG: The man **removed** the rock **which** pierced through his shoulder.
ARB: **Azaal** ar-rajulu aṣ-ṣaxrata **allati** daxalat fii katifih.
SPA: El hombre **se quitó** la piedra **que** perforó su hombro.
GER: Der Mann **entfernte** den Fels, **der** durch seine Schulter drang.
HUN: Az ember **eltávolította** a követ, **amely** a vállába fúródott.

5) ROR marked with 'because'

ENG: He falls on the ground **because** the paper hits him.
ARB: Waqa'a 'ala al-ard **bisabab** al-waraqa allati irtaṭamat bihi.
SPA: Se cae al suelo **porque** el papel le golpea.
GER: Er fällt zu Boden, **weil** das Papier ihn trifft.
HUN: Földre esik, **mert** a papírlap beléütközik.

6) ROR marked with a complement

ENG: He **walked** to where the water **came from**.
ARB: **Masha** ḥaythu al-makaan alladhi **atat minhu** al-miyaah.
SPA: **Caminó** hacia donde **había** agua.
GER: Er **lief** dorthin, wo das Wasser **herkam**.
HUN: **Odament**, **ahonnan** a vízfolyás **közeledett.**

Since anaphoric shifting and deictic anchoring operate on the level of preferences rather than rules, it is important to note, based on checks with native speakers, that each of the six ROR types is combinable with deictic anchoring as well as anaphoric shifting across the four tested languages. The measure of anaphoric shifting was the proportion of events expressed as closed units, i.e. 'viewed from the outside', and the measure of deictic anchoring was the proportion of events expressed as open units, i.e. 'viewed from the inside' (Table 1). The linguistic means typically used to express anaphoric shifts were positional time adverbials and/or perfective aspect, while imperfective aspect and/or durative time adverbials were typically employed to anchor events deictically.

Table 1. A group-level overview of (a) reproduced events, (b) actual number of events, (c) events marked as closed, (d) events marked as open, (e) intra-episodic RORs, (f) inter-episodic RORs, and (g) intra-episodic RORs previously expressed in chronological positions. Totals, mean scores (*M*), and standard errors of the mean (*SE*) are shown in (a-d), and total ROR types with % from all RORs are shown in (e-g).

	Reproduced events	**Actual events**	**Marked closed**	**Marked open**	**Intra-episodic ROR**	**Inter-episodic ROR**	**Previously chrono ROR**
	Total (M, SE)	Total	Total (M, SE)	Total (M, SE)	Total (%)	Total (%)	Total (%)
Arabic	**1123** (56.2, 4.6)	**59**	**505** (37.8, 3.7)	**367** (18.4, 1.7)	**74** (86%)	**12** (14%)	**11** (13%)
Spanish	**1634** (81.7, 4.5)	**59**	**948** (60.4, 4)	**427** (21.4, 1)	**87** (80%)	**22** (20%)	**7** (6%)
Hungarian	**1129** (56.5, 4.2)	**59**	**723** (45.1, 4.9)	**118** (6.4, 1.3)	**112** (84%)	**21** (16%)	**9** (7%)
German	**1968** (98.4, 6.9)	**59**	**925** (63.2, 5.8)	**157** (7.8, 2.2)	**224** (86%)	**36** (14%)	**31** (12%)

Table 1 summarises the dataset regarding the total number of verbalised events in relation to the actual number of events (based on a consensus of the 8 coders). In line with the predictions, the proportion of events marked as open is higher in the aspect language groups (32.7% in Arabic, 26.1% in Spanish) than in the non-aspect language groups (9.9% in Hungarian, 11.4% in German). Non-aspect language speakers expressed ongoingness either via durative aspectual adverbs (100% in German, 34.5% in Hungarian) or in the form of post-verbal positioning of coverbs (65.5% in Hungarian). Table 1 also shows that inter-episodic RORs (i.e. macro jumps) were present (14-20%) yet markedly less frequent than intra-episodic RORs (i.e. micro jumps). 6-13% of RORS were repetitions of events that had been ordered chronologically in an earlier mention.

4. Results

4.1 Between-group comparisons of reverse order reports

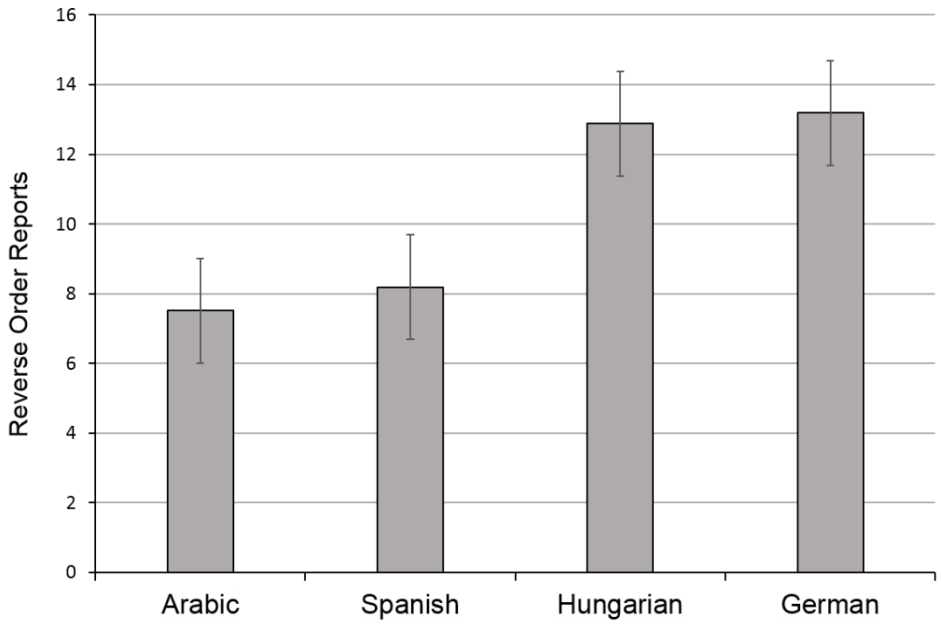

Figure 1. Mean percentages of propositional units classified as reverse order reports per language group.

A one-way ANOVA (with percentages of propositional units classified as RORs) returned a significant effect of language group $F(3,76)=26.012$, $p<.001$, $\eta_p^2=.51$. Post-hoc tests using Bonferroni correction for multiple pairwise comparisons (alpha lowered to .0043) confirmed that both the German ($M_{GER}=13.19$, SD=2.61) and the Hungarian group ($M_{HUN}=12.88$, SD=2.90) digressed from chronological order in their film retellings significantly more often than the Arabic ($M_{ARB}=7.51$, SD=3.23) and the Spanish group ($M_{SPA}=8.19$, SD=1.47). As Figure 1 illustrates, the standardised reverse order report frequencies patterned in accordance with the aspect vs. non-aspect divide. Aspect language groups (Arabic and Spanish) did not differ from each other ($p=.846$), however, they encoded significantly fewer RORs (p's <.001) in comparison with either non-aspect group (German and Hungarian). There was no ROR difference between the two non-aspect languages ($p=.982$). Following a significant analysis of variance, a specific comparison grouping the aspect languages vs. the non-aspect languages was run via an ANOVA including a planned contrast. This way of comparing language groups also returned a significant ROR difference $t(76)=-8.79$, $p<.001$.

4.2 Types of linguistic marking used for reverse order reports

Table 2. Reverse order reports across six types of linguistic markers used for their expression (*Tense/Asp* = tense/aspect, *Relative* = relative clause, *Complem* = object complement, *Because* = temporal/causal subordination with 'because', *1xTadv* = single temporal adverb*, DualTadv* = dual temporal adverb) and zero marking. For each group, raw ROR frequencies (*Freq*), standard errors of the mean (*SE*), and % from ROR totals are shown.

	Tense/Asp	**Relative**	**Complem**	**Because**	**1xTADV**	**Dual TADV**	**Zero**	**Total**
	Freq (SE) %	Freq (SE) %	Freq (SE) %	Freq (SE) %	Freq (SE) %	Freq (SE) %	Freq (SE) %	
Arabic	**27** (.27) 31%	**19** (.29) 22%	**10** (.20) 12%	**6** (.0) 7%	**17** (.19) 20%	**1** (.0) 1%	**6** (.2) 7%	**86**
Spanish	**45** (.29) 41%	**19** (.38) 17%	**18** (.13) 17%	**6** (.2) 6%	**17** (.11) 16%	0	**4** (.33) 4%	**109**
Hungarian	**44** (.36) 33%	**28** (.22) 21%	**19** (.35) 14%	**6** (.2) 5%	**26** (.21) 20%	**4** (.0) 3%	**6** (.0) 5%	**133**
German	**90** (.95) 35%	**66** (.41) 25%	**34** (.29) 13%	**23** (.4) 9%	**42** (.2) 16%	**3** (.0) 1%	**3** (.0) 1%	**261**

Further analyses of variance were conducted to examine ROR distribution across linguistic means and to check the extent to which linguistic marking of RORs differs across groups. In each of these tests, group membership was the independent factor and the percentage of ROR type

from all RORs expressed by the given participant was the dependent variable. Absence of significance was interpreted as a signal of essentially similar ROR marking across languages. Percentages and ROR counts per type are provided in Table 2 for each group. The tests (each run with a Bonferroni correction) showed no significant differences for any between-group comparison, including tense/aspect contrast $F(3,76)=.082$, $p=.969$, relative clauses $F(3,76)=2.086$, $p=.109$, complements $F(3,76)=.005$, $p=1.0$, *because* clauses $F(3,76)=.888$, $p=.452$, and single temporal adverbials $F(3,76)=.837$, $p=.478$.

The next step assessed the degree of variation for individual ROR types in each group. With the aim of comparing the consistency of ROR choices within languages, a coefficient of variation (CV) was computed for each of the five most frequent ROR markers (CV=standard deviation of raw ROR frequency/group mean of raw ROR frequency x 100). A variance measure (CV) was used instead of a frequency measure in order to normalise the standard deviation with respect to the group means. The context of substantial group mean differences (e.g. $M_{GER}=5$, $M_{ARB}=2$ for tense/aspect RORs, where an SD of 0.5 corresponds to 10% in the German group but 40% in the Arabic group) necessitated that the comparisons of the spread in ROR variability are based on normalised SDs rather than SDs proportional to the mean. For tense/aspect RORs, variation was greater in the German ($MCV_{GER}=91.3$) and Arabic ($CV_{ARB}=90.8$) groups than in the Spanish ($CV_{SPA}=43.02$) and Hungarian ($CV_{HUN}=71.9$) groups; relative clauses varied along the non-aspect/aspect divide ($CV_{ARB}=115.7$ and $CV_{SPA}=134.3$ while $CV_{HUN}=78.2$ and $CV_{GER}=58.2$). Complement use was more varied is Arabic ($CV_{ARB}=152.2$) and Hungarian ($CV_{HUN}=134.3$) than in Spanish ($CV_{SPA}=79.8$) and German ($CV_{GER}=85.6$), with a different picture emerging for *because* clauses (highest of all CVs for Spanish/Hungarian $CV_{SPA/HUN}=190.4$, followed by $CV_{ARB}=156.7$ and $CV_{GER}=123.9$). Interestingly, temporal adverb use (predominantly anaphoric shifters) varied more in the aspect groups ($CV_{ARB}=103.0$ and $CV_{SPA}=79.0$) than in the non-aspect groups ($CV_{HUN}=75.3$ and $CV_{GER}=43.4$). Overall, the variation was highest within the Arabic group and ROR choices showed most consistency within the German group.

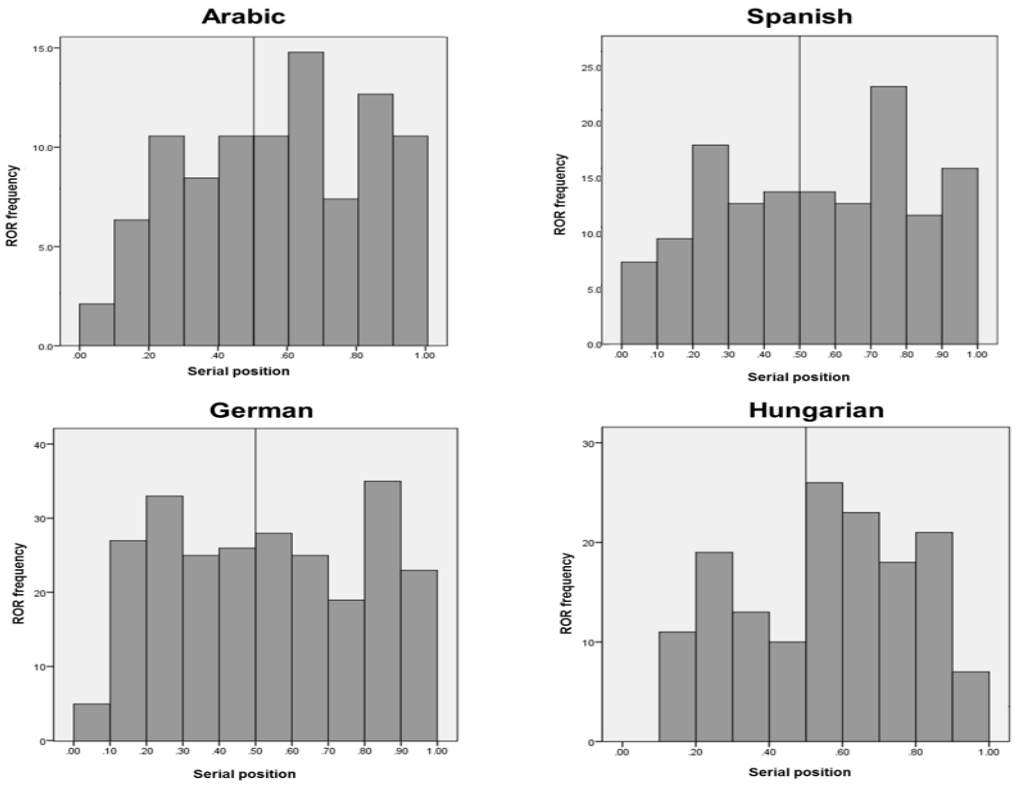

Figure 2. Raw frequencies of reverse order reports as a function of serial position in each of the four groups. For comparability across episodes and individual differences in event segmentation degrees, serial position for each ROR was calculated by dividing its ordinal position within an episode by the total number of propositions expressed in the given episode.

4.3 Variation in reverse order reports depending on serial positions

In order to test whether the likelihood of RORs is lowest around episodic starts, and if it increases as the episodes progress, ROR frequencies were compared across serial positions (ordinal number of ROR from start of episode X/total number of propositions in episode X). Figure 2 shows a proportional increase in the occurrence of RORs from the first serial position up to 30% of the average episodic length. Out of all RORs (N_{ARB}=86, N_{SPA}=109, N_{HUN}=133, N_{GER}=261), not a single reversal of order appeared in episode-initial position in any of the four groups. Regardless of the language of encoding, the ROR distribution was marginally skewed to the right (i.e. -.085 in the Spanish group, -.090 in the Arabic group, .44 in the German group, -.135 in the Hungarian group) however, deviation of values from symmetry around the mean (M_{ARB}=.57, SD=.26; M_{SPA}=.55, SD=.27; M_{GER}=.54, SD=.28; M_{HUN}=.57, SD=.25) were found within the standard range of

acceptable skewness of ±2. Beyond 30% of episodic length onwards, the data stop showing a proportional increase of RORs together with distance from the start point.

Regarding the right episodic boundaries, in each language group there were multiple instances of RORs in episode-final positions (i.e. 2% of the Arabic, 3% of the Spanish, 7% of the German, and 6% in the Hungarian RORs were episode-final). Nevertheless, the trend observed in Figure 2 is that episodic boundaries on both ends tend to be generally less implicated in order reversals. For a closer look, episode-final RORs included: Arabic: → ka`annahu saqaṭa fi: rima:l mutaḥarrika *'it seems he fell into moving sands'* ← 'indama: bada`a bi al ḥafr '*when he started digging';* Spanish: → entra en el mundo *'he enters the world'* ← en donde ha visto aqua *'where he has seen water'*; German: → und genau dort fällt er eben dann wieder durch dieses papierloch *'and that's where he again falls through this hole of sheets of paper'* ← was er in die erde gerissen hat '*which he had torn into the ground*'; Hungarian: → visszafolyt egy résen keresztül megint a sivatagba *'he sifted through a gap back into the desert'* ← ahonnan elindult *'from where he set off'*. These four instances also illustrate how RORs were used to serve the discourse function of explaining or providing the background of the event in the preceding sentence.

4.4 Relationship between reverse order reports and event linking

In the next step, Pearson product-moment correlation coefficients were computed to assess the relationship between the amount of anaphoric shifting and ROR frequencies in Arabic and Spanish narratives. This step was taken to calculate how strongly anaphoric shifting in narratives is linked to order reversal. Both perfective markers and positional time adverbials were included in this calculation. A positive correlation was found between the two variables in the Arabic dataset, r=.689, N=20, p < .001, as well as in the Spanish dataset, r=.737, N=20, p <.001. These results signal that in aspect languages (i.e. with grammatical means for both deictic anchoring and anaphoric shifting), the more frequently speakers present events as closed units, i.e. from the outside, the more often digressions from chronology tend to occur. A closer look at the types

of anaphoric shifters directly within RORs showed that perfective aspect clearly dominated (75.5% in Arabic, 80.1% in Spanish), followed by positional time adverbials (19.8% in Arabic, 14.3% in Spanish) and the combination of both markers (4.7% in Arabic, 5.6% in Spanish). Separate within-group *t*-tests were computed using RORs only to examine whether the rate of digressions from chronology tends to be higher for cases of anaphoric shifting compared to cases of deictic anchoring. Anaphoric shifting in RORs was found significantly more frequent than deictic anchoring in the Arabic retellings $t(19)=3.082$, $p=.006$ as well as in the Spanish retellings $t(19)=3.701$, $p=.002$. Overall, these results are in line with the view that anaphoric shifting can be central to the mechanism of digressions from chronology in aspect language narratives.

We also checked the possibility that speakers of an aspect language who use deictic anchoring more frequently (in Arabic, 32.68% of all events) produce significantly fewer RORs than speakers of an aspect language in which deictic anchoring is used more sparingly (in Spanish, 26.13% of all events). An independent *t*-test comparing the proportions of RORs to the total of deictically anchored events in the given group showed that indeed Arabic speakers digressed from chronology relatively less often (RORs constituted 25.1% of all deictically anchored events) than Spanish speakers (RORs constituted 31.2% of all deictically anchored events), but this difference did not reach statistical significance $t(38)=-1.772$, $p=.084$.

5. Discussion

Analyses of event order in a free verbal recall task revealed that the mechanism underlying adherence and digressions from chronology across and within languages is guided by a panoply of factors. On the crosslinguistic level, our results support the prediction that event ordering choices closely interact with the presence vs. absence of a grammatical marker for ongoingness in the language of verbalisation. Significant between-group differences in the frequency of reverse order reports patterning in line with aspectual characteristics of the used language suggest that grammatical aspect plays a vital role in foregrounding either situation-internal or

boundary-focused event features, which has direct implications for sequencing. While speakers of aspect languages with situation-internal features in focus tended to adhere to chronology, speakers of non-aspect languages with event boundaries in focus digressed from natural event order significantly more often. Nevertheless, contrasts in the propensity to reverse temporal order cannot be taken to automatically imply language-specificity in ROR marking. The fact that no fundamental differences were detected in how various linguistic means are used to map the activated event structure onto the developing discourse structure confirms that speakers do indeed utilise a range of available linguistic choices to mark RORs in highly comparable ways across languages. On the more language-independent level, results showed stronger adherence to chronology close to episodic starts. The next sections spell out the significance of the main findings, nest them in the extant empirical context, and propose a crosslinguistically informed extension to modelling principles of component order in narrative discourse.

5.1 Grammatical aspect and language-specificity in reverse order reports

In what way can grammatical aspect be accountable for the observed pattern of results? Digressions from chronology typically emerge where discourse structure is built on event chains in which temporal boundaries are more active either due to perfective aspectual marking or anaphoric shifts with positional time adverbials. RORs may more readily coincide with events presented as completed because activated end states constitute arguably more stable anchor points for temporal detours from chronology (*before the gate closed, the man sneaked through*) than the ongoing events do (*before the gate was closing, the man sneaked through*). The rationale is that perfective aspect and anaphoric shifting are effective processing cues which direct the speaker to construct holistic event representations with temporal boundaries foregrounded. When speakers locate their perspective 'outside' the event, i.e. including the right temporal boundary, they also construct a stable temporal yardstick supporting the mobility of subsequent discourse segments in forward as well as backward direction. Increased mobility can

thus be attributed to viewing events as movable compact closed units. Following this idea, it is not surprising that in aspect languages a far larger proportion of RORs appear following perfective (81.9% in Arabic, 75.5% in Spanish) rather than imperfective structures. This is observed in spite of the fact that there is no rule in aspect languages that would prevent speakers from focussing on temporal boundaries. A qualitative text inspection suggests that imperfective structures function more typically as 'telescopes' into the ongoing phases of Event X, during which either the onset of Event Y interrupts Event X preventing its completion (e.g. *he was climbing down skilfully but the supporting rock fell off*), or the subsequently described event Y occurs while event X is still in progress (e.g. *the sand was trickling down to the seabed and it gradually formed a man-like creature*). When the imperfective aspect is used, it highlights the importance of the event's ongoing phase and makes event-internal features (e.g. locations (Ferretti et al. *2007*, Morrow 1990) or agents (Carreiras et al. 1997)) more available than temporal boundaries. Events marked with imperfectives tend to be built in forward direction and may less readily combine with order reversals because of the perspective they give rise to. The imperfective locates the speaker's perspective 'inside' the event, highlighting one of its phases. Locating topic time inside an event arguably decreases event mobility for two reasons. Moving only a fraction of an event would not only disrupt the event's internal coherence but also the information flow as the fraction would no longer relate to the rest of the event. Also, it becomes difficult to manipulate an event as a whole when only a certain phase of it is selected for expression. Alternatively, if an event is viewed as a whole and its expression includes explicit or implicit reference to the right temporal boundary, we argue that this constitutes a reliable anchor point for a subsequent order reversal.

Framed within the Basic Time Structure (Klein 1994, 2009), aspect languages equip speakers with a grammatical marker for ongoingness to capture the internal dynamics of events by locating topic time fully within the time of situation. The use of imperfective verb marking aids *phasal decomposition of events* (von Stutterheim et al. 2012: 840) , through which a specific sub-interval within an event is activated rather than the event as a whole. When speakers face the

need to integrate this type of activated information into the unfolding discourse representation, order reversal is less compatible as the next move because the current referential anchor is volatile, in a sense that it can oscillate anywhere within the confines of the current topic time (Figure 3.A). Consistency with order reversal changes if the topic time extends to the right boundary of the situation that precedes the ROR. If situation completion is conveyed in discourse (e.g. by means of perfective marking in aspect languages or explicit temporal shifters in non-aspect languages), the speaker establishes a referential anchor for a forward or a backward temporal move for the following topic time. A situation model that captures a point of completion is thus posited to cohere more strongly with a subsequent topic time in either direction on the timeline (Figure 3.B). These assumptions are consistent with the coherence and continuity principles of the structure building model (Gernsbacher 1990).

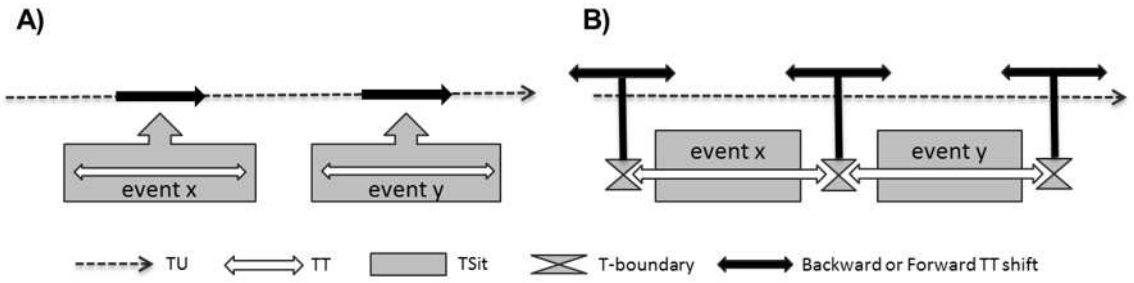

Figure 3. A) Discourse representation model with temporal linkage based on deictic anchoring (TT is maintained constant with the TU in compatibility with forward TT shifting). B) Discourse representation model with temporal linkage based on anaphoric shifts (TT is located in the post-time of the preceding TSit, establishing a temporal anchor for both forward and backward TT shifts). TT stands for *topic time* (time for which the assertion is made), TSit for *situation time* (time for which the situation holds true), and TU for *utterance time* (i.e. time at which the utterance is made) (Klein 1994: 3).

A few pertinent methodological aspects need to be considered. Our findings align with the idea that the use of imperfective aspect reflects activation of event-internal phases in progress, not extending to the activation of completion points. This interpretation is at variance with Madden and Zwaan (2003), where the imperfective aspect was found not to constrain event representations to an unfinished state, arguably due to ambiguity in the static pictures used as stimuli. Stills of completed events can be problematic because they can be interpreted as still in

progress rather than fully finished (2003: 668). Using video stimuli instead benefits disambiguation as the completion stage is portrayed dynamically, either as including the intermediate stage (showing how the event unfolds up to the completion point) or as fully reached (showing the completion point and part of the posttime). In this sense, it can be argued that video stimuli encapsulate event dynamicity in a manner comparable to stories (Magliano and Schleich 2000) in which the activation bias triggered by imperfective aspect is strong towards ongoing phases. Corroborating evidence for the view that imperfective aspect use enables speakers to defocus completion points (and employ e.g. bare verb phrases instead, as in *two women are walking*) comes from research on goal-oriented motion events (Schmiedtová 2011, 2013). Analyses of narratives showed that the frequency of event-internal phase-denoting expressions increase under time pressure in the production of aspect language speakers (Russian, English, Polish), but not of non-aspect language speakers (German) (2011: 152). These analyses signal that phasal decomposition might function as the default for aspect language speakers when the communicative task is cognitively more taxing.

Varying task demands are also most likely to impact event ordering. Inherent to an offline film retelling task are the steps of remembering the processed visual input and ordering event components during verbal recall from memory. Even though the input episodes were kept relatively short, the storage and retrieval of information for expression in a narrative format necessarily involves a memory component. Previous research shows that event memory closely interacts with grammatical aspect. Athanasopoulos and Bylund (2013) observed that speakers of a language without grammatical aspect tend to rely significantly more on the right temporal boundary of events in verbal descriptions and also in memory-based similarity judgements than speakers of an aspect language. Analyses of reverse order reports here showed that in this study too non-aspect language speakers tended to focus more on the right temporal boundary when committing events to memory, compared to aspect language speakers. Different results may be expected in an alternative experimental scenario without a memory component, in which the verbal descriptions would be elicited online. In an online task, verbalisation could unfold

alongside perception, without the need for a memory buffer, thus in an arguably tighter link with information extraction allowing a more direct witnessed-to-reported event order mapping. Support for the idea that language-specific effects in a task with a memory component may be stronger than in an online task comes from Athanasopoulos and Bylund (2013), who reported that crosslinguistic differences found in a memory-based task disappeared when the same task was performed online. Given the different cognitive demands of the two task types, it is important to situate and interpret the reported language effects on event ordering within the context of free verbal recall, not necessarily extending to online retellings. The exact extent to which event order in online film retellings may differ from the order during offline verbal recall is an epistemological issue that remains open for future investigations.

5.2 Shared temporal ordering principles exhibited in free verbal recall

Narrative planning irrespective of the language of expression was found consistent with the isomorphism principle (Ohtsuka and Brewer 1992), i.e. a far greater proportion of event components in each text matched rather than digressed from the order presented in the video stimulus (overall digressions: ROR_{ARB}=7.66%, ROR_{SPA}=8.02%, ROR_{HUN}=12.75%, ROR_{GER}=13.21%). This finding adds to the wider context of accumulating evidence in free recall tasks with unrestricted output order (Bhatarah et al. 2009; Kahana, 1996; Ward et al. 2010), which collectively support the view that forward ordering may be 'a general principle of memory' (Hurlstone et al. 2014). There are a few variables that need to be considered with care. Unlike in serial recall (Bhatarah et al. 2009), an important feature of free recall is the subjective preference for ordering that may originate for instance from topicalisation, in which case the order of some event components in a sequence is swapped not due to memory decay but because the speaker finds the latter occurring event more salient as thus mentions it first. So while some digressions from the order of presentation in a retelling task can be caused by a retrieval problem or careless planning, events may be narrated non-chronologically to highlight a particular thematic relation for the listener (such as dominance or contrast). Another variable in free verbal recall is the

possibility that the same event may be intentionally mentioned more than once, e.g. first at the position mirroring the input order and later as a flashback. Despite these differences between free verbal recall in narratives and serial recall (in which order reversal constitutes an error), the tendency for chronological ordering to dominate over RORs is evident in both task types. Ordering preferences in each of the four groups in this study point to a prevailing forward-oriented verbal recall across episodes with varying input length and hierarchical complexity, corroborating the observed general propensity to use chronological ordering in free recall regardless of the varying sequence length of components in the input (Hurlstone et al. 2014).

Current theoretical modelling of free recall (Farrell 2012) incorporates the idea of spontaneous sequence parsing into episodic clusters. Under this assumption, when we mentally return to past events, we form clusters of temporally related event components that facilitate later recall of searched episodes (Radvansky and Copeland 2006, Swallow et al. 2009, Zacks et al. 2001). It follows that at whichever level of hierarchical structure we are (macro or micro level), an episodic cluster must first be accessed before its contents can be retrieved. An important exception facilitating retrieval is that clusters that are currently left open 'allow the use of an intact context to drive recall' (Farrell 2012: 224). This point has direct relevance for crosslinguistically shared patterns in reverse order reports. As observed in Spanish and Arabic retellings, episodic clusters comprising deictically anchored events tend to be left open on the right end. Episodic clusters in narratives can be kept open-ended in aspect languages by placing imperfective structures in cluster-final positions. If a cluster is not closed, mobility of the given event as a whole may be reduced. Building on this assumption, if imperfective structures were not directly linked to maintaining forward event flow, parallels in chronological ordering preferences between otherwise unrelated languages would be unlikely. These ideas are consistent with reported crosslinguistic evidence showing that right event boundaries in aspect languages (Arabic, English, Russian, Spanish) are overall less often referred to in expression, receive fewer visual fixations prior to verbalisation, and are recalled with lower accuracy than in non-aspect languages (Dutch, German) (von Stutterheim et al. 2012: 856). A proportional odds logistic regression test

examining the predictive power of order reversal following aspectually 'open' vs. 'closed' events may provide a useful effect verification tool in future research, and it can also further inform free verbal recall modelling.

5.3 Limitations and future directions

An inherent feature of elicited production is that the observed patterns are rarely extensible to natural unprompted discourse (Simner and Pickering 2005), even though the theoretical significance of both is not questioned. One way to test whether comparable crosslinguistic contrasts in event ordering also emerge in natural language production could be to take conversation data in which interlocutors discuss complex events and use it as a naturalistic test bed for checking whether imperfective structures are indeed more resistant to anchoring reverse order reports. Another extension that would benefit both naturalistic and controlled designs is the addition of a task-independent test of working memory, or some of its subcomponents such as the episodic buffer (Baddeley 2000). Such addition would help to delineate the extent to which between-subject variation in order reversal is attributable to memory storage capacity and how much is an aspect-modulated phenomenon. With working memory controlled for, an additional design sharpener could be to compare within-participant differences in a verbal task in which aspect language speakers would be primed to anchor events deictically in one task vs. shift topic time anaphorically in the other. Also, additional coding of lexical frequency information and verb type details (Bott 2010) could provide further important knowledge about aspect-ROR relations. ROR coding for verb types as classified for instance by Vendler (1957) could reveal that some of the four lexico-aspectual categories (i.e. states, activities, accomplishments, and achievements) attract order reversals more than others. This possibility cannot be ruled out in the present study, and one plausible prediction would be that RORs combine with telic verbs (e.g. accomplishments) overall more often than with atelic verbs (activities) because the temporal boundary inherent to telic verbs can serve as a stable ROR anchor. Whether lexical aspect is a causal factor in RORs is beyond the scope of this work and remains for future investigations.

Another causal factor in RORs may be cue strength. If imperfective or progressive forms highlight ongoingness, the same rationale should hold in the opposite direction, i.e. perfective aspect should be able to highlight the completion stage of events. Whilst the general capacity of activating the right event boundary via perfective aspect is unquestioned, what may vary is the strength of lexical vs. grammatical markers to perform this function. One reason is differences in cue saliency (Bates and Goodman 2001, Ellis 2006). Since temporal adverbs are freestanding and more varied than verbal affixes or temporal particles, they may overshadow the less salient grammatical cues when narratives are construed. Whether the choice of salient lexical markers can lower ROR-associated processing cost in comparison with grammatical markers is an open empirical question for future inquiry, for instance via timed judgements of lexically vs. grammatically marked RORs.

To measure the extent of pure aspect-modulated influence on order reversal more sensitively, a formidable methodological advancement would also be a careful control over the temporal properties of each input sequence (including balanced length, complexity, relationship status between individual event components). This would allow more direct comparisons with output order from free recall experiments (Lewandowsky et al. 2008, Ward et al. 2010), verify whether iconicity in narratives tends to be violated more often in complex rather than in simpler situations (Dery and Koenig 2015), account for possible effects of temporal grouping within sequences (Burgess and Hitch 2006), and strengthen theoretical modelling of free verbal recall (Farrell 2012) in which grammatical aspect would feature as one of the core components. A combination of the suggested extensions in future experimental scenarios with a crosslinguistic design followed in this study will not only enable richer insights about the magnitude of aspect-driven influence on event sequencing choices in discourse but it will also present an informative springboard for further explorations about the link between language structure and event cognition.

6. Conclusion

In seeking to identify some of the fundamental principles that guide component ordering in discourse production, this article focussed on a combination of two complementary layers of analysis, the less researched language-specific layer of aspect-modulated event ordering preferences in tandem with the more general layer of variation in adherence to chronology changing with serial position. Evidence from reverse order reports in four languages contributes to our understanding of how grammatical aspectual operators interact with event component activation and situation model construction (Becker et al. 2013, Carreiras et al. 1997, Morrow 1990), which are of immediate relevance to sequence processing in larger stretches of discourse (Magliano and Schleich 2000, Simner and Pickering 2005). In languages where temporal reference in discourse is typically achieved by focussing on the ongoing development of situations and highlighting the dimension of continuity, stricter adherence to chronology in event ordering emerges as an epiphenomenon of the imperfective aspect use. Conversely, when speakers foreground event completion and explicitly shift the time of assertion from one (sub)event to the next, more frequent reverse order reports are observed. These biases are sensitive to variation in temporal foci, which are directly linked to aspectual means available in a given language. An important implication for examining message planning in discourse production is the need to recognise that the mechanism for expressing event order in narratives is guided not only by language-independent processes of information retrieval from memory but also by language-specificity in anchoring events via grammatical aspect.

Notes

* Research reported in this article was funded in part from the ECF-2014-459 grant awarded to Norbert Vanek by the Leverhulme Trust. We would also like to thank for the help of language assistants during data collection, transcribing, translation, coding and disambiguation. We owe

many thanks to Dima Al-Malahmeh, Fatma Said and Lior Laks on the Arabic end, Erzsébet Kulcsár and Aba Szöllősi on the Hungarian end, María Muradás-Taylor and Gonzalo Torres on the Spanish end, and Elaine Schmidt and Beatrice Szczepek Reed on the German end. Appreciation is also due to the Centre for Language Learning and Use at the University of York, who kindly supported the first author during the data collection stage with Hungarian participants and the during the subsequent writing-up stage. Elicitation of data from Arabic, German, and Spanish participants in this article was funded by a research grant of the German-Israeli Foundation for Research and Development 1-789-109.4/2003 awarded to Ruth Berman, Tel Aviv University, and Christiane von Stutterheim, University of Heidelberg.

References

Abondolo, Daniel. 1998. Hungarian. In Daniel Abondolo (ed.), *Uralic languages*, 428–456. Routledge: London.

Athanasopoulos, Panos & Emanuel Bylund. 2013. Does grammatical aspect affect motion event cognition? A cross-linguistic comparison of English and Swedish Speakers. *Cognitive Science* 37(2). 286–309.

Ayoun, Dalila & Rafael Salaberry. 2005. *Tense and aspect in Romance languages: Theoretical and applied perspectives*. Amsterdam: John Benjamins.

Baddeley, Alan 2000. The episodic buffer: a new component of working memory? *Trends in Cognitive Sciences* 4(11). 417–423.

Baker, Linda. 1978. Processing temporal relationships in simple stories: Effects of input sequence. *Center for the Study of Reading Technical Report;* no. 084.

Bardovi-Harlig, Kathleen. 1994. Reverse order reports and the acquisition of tense: Beyond the principle of chronological order. *Language Learning* 44(2). 243–282.

Bates, Elisabeth & Judith Goodman. 2001. On the inseparability of grammar and the lexicon: Evidence from acquisition. In Michael Tomasello & Elisabeth Bates (eds.), *Essential readings in developmental psychology. Language development: The essential readings*, 134-162. Malden: Blackwell Publishing.

Becker, Raymond, Todd Ferretti & Carol Madden-Lombardi. 2013. Grammatical aspect, lexical aspect, and event duration constrain the availability of events in narratives. *Cognition* 129(2). 212–220.

Bergen, Benjamin & Kathryn, Wheeler. 2010. Grammatical aspect and mental simulation. *Brain and Language* 112(3). 150–158.

Berman, Ruth & Dan, Slobin. 1994. Narrative structure. In Ruth Berman & Dan Slobin (eds.), *Relating events in narrative: A crosslinguistic developmental study*, 39–84. Hillsdale, NJ: Lawrence Erlbaum.

Bhatarah, Parveen, Geoff Ward, Jessica Smith & Louise Hayes. 2009. Examining the relationship between free recall and immediate serial recall: Similar patterns of rehearsal and similar effects of word length, presentation rate, and articulatory suppression. *Memory & Cognition* 37(5). 689–731.

Bott, Oliver. 2010. *The processing of events*. Amsterdam: John Benjamins.

Brewer, William. 1984. The story schema: Universal and culture-specific properties. *Center for the Study of Reading Technical Report;* no. 322.

Briner, Stephen, Sandra Virtue & Christopher Kurby. 2012. Processing causality in narrative events: Temporal order matters. *Discourse Processes* 49(1). 61–77.

Burgess, Neil & Graham Hitch. 2006. A revised model of short-term memory and long-term learning of verbal sequences. *Journal of Memory and Language* 55(4). 627–652.

Burt, Christopher, Simon Kemp & Martin Conway. 2008. Ordering the components of autobiographical events. *Acta Psychologica* 127(1). 36–45.

Burt, Christopher, Simon Kemp, Jonathan Grady & Martin Conway. 2000. Ordering autobiographical experiences. *Memory* 8(5). 323–332.

Bylund , Emanuel. 2011. Language-specific patterns of event conceptualization: Insights from bilingualism. In Aneta Pavlenko (ed.), *Thinking and Speaking in Two Languages*, 108–142. Bristol, UK: Multilingual Matters.

Carota, Francesca & Angela Sirigu. 2008. Neural bases of sequence processing in action and language. *Language Learning* 58. 179–199.

Carreiras, Manuel, Nuria Carriedo, Maria Alonso & Angel Fernández. 1997. The role of verb tense and verb aspect in the foregrounding of information during reading. *Memory & Cognition* 25(4). 438–446.

Carroll, Mary & Christiane von Stutterheim. 2003. Typology and information organisation: perspective taking and language specific effects in the construal of events. In Anna Ramat (ed.), *Typology and Second Language Acquisition*, 365–402. Berlin: de Gruyter.

Chafe, Wallace. 1979. The flow of thought and the flow of language. In Talmy Givón (ed.), *Discourse and Syntax*, 159–181. New York: Academic Press.

Clark, Herbert. 1974. Semantics and comprehension. In Arthur Abramson (ed.), *Linguistics and adjacent arts and sciences* 2, 1291–1428. The Hague: Mouton.

Clark, Herbert & Eve Clark 1968. Semantic distinctions and memory for complex sentences. *Quarterly Journal of Experimental Psychology* 20(2). 129–138.

Claus, Berry & Stephanie Kelter. 2006. Comprehending narratives containing flashbacks: Evidence for temporally organised representations. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 32(5). 1031–1044.

Dery, Jeruen & Jean-Pierre Koenig. 2015. A narrative-expectation-based approach to temporal update in discourse comprehension. *Discourse Processes* 52(7). 559–584.

Drummer, Janna, Elke van der Meer, Gesa Schaadt, Gesa. 2016. Event-related potentials in response to violations of content and temporal order. *Neuropsychologia* 80. 47–55.

Ellis, Nick. 2006. Cognitive perspectives on SLA: The associative-cognitive CREED. *AILA Review* 19(1). 100–121.

Fabricius-Hansen, Cathrine. 2006. Tense. *Encyclopedia of language and linguistics,* 2nd ed., 566–573. Amsterdam: Elsevier.

Farrell, Simon. 2012. Temporal clustering and sequencing in short-term memory and episodic memory. *Psychological Review* 119(2). 223–271.

Ferretti, Todd, Marta Kutas, Ken McRae. 2007. Verb aspect and the activation of event knowledge. *Journal of Experimental Psychology, Learning, Memory, and Cognition* 33(1). 182–196.

Ferretti, Todd, Hannah Rohde, Andrew Kehler, Melanie Crutchley. 2009. Verb aspect, event structure, and coreferential processing. *Journal of Memory and Language* 61(2). 191–205.

Flecken, Monique & Johannes Gerwien. 2013. Grammatical aspect influences event duration estimations: evidence from Dutch. In Markus Knauff, Michael Pauen, Natalie Sebanz & Ipke Wachsmuth (eds.), *Cooperative Minds: Social Interaction and Group Dynamics. Proceedings of the 35th Annual Meeting of the Cognitive Science Society*, 2309–2314. Austin TX: Cognitive Science Society.

Gernsbacher, Morton. 1990. Two decades of structure building. *Discourse Processes* 23(3), 265–304.

Givón, Talmy. 1992. The grammar of referential coherence as mental processing instruction. *Linguistics* 30(1). 5–56.

Greenberg, Joseph. 1963. Some universals of grammar with particular reference to the order of meaningful elements. In Joseph Greenberg (ed.), *Universals of Language* 2, 73–113. Cambridge, MA: MIT Press.

Hodgson, Miren. 2003. The acquisition of Spanish perfective aspect: A study on children's production and comprehension. *ZAS Papers in Linguistics* 29. 105–117.

Hoeks, John, Laurie Stowe, Charlotte Wunderink. 2004. Time is of the essence: Processing temporal connectives during reading. In Kenneth Forbus, Dedre Gentner & Terry Regier (eds.), *Proceedings of the Twenty-Sixth Annual Conference of the Cognitive Science Society*, 577–582. Mahwah, NJ: Erlbaum.

Hopper, Paul. 1979. Aspect and foregrounding in discourse. In Talmy Givón (ed.), *Syntax and semantics 12: Discourse and syntax*, 213–241. New York: Academic Press.

Hurlstone, Mark, Graham Hitch & Alan Baddeley. 2014. Memory for serial order across domains: an overview of the literature and directions for future research. *Psychological Bulletin* 140(2). 339–373.

Habets, Boukje, Bernadette Jansma & Thomas Münte. 2008. Neuropsysiological correlates of linearization in language production. *BMC Neuroscience* 9(1). 77.

Kahana, Michael. 1996. Associative retrieval processes in free recall. *Memory & Cognition* 24(1). 103–109.

Kelter, Stephanie & Berry Claus. 2005. How do readers deal with flashbacks in narratives? In B. Bara, L. Barsalou & M. Bucciarelli (eds.), *Proceedings of the Twenty-Seventh Annual Conference of the Cognitive Science Society*, 1126–1131. Mahwah, NJ: Erlbaum.

Khalil, Esam. 2000. *Grounding in English and Arabic news discourse*. Amsterdam: Benjamins.

Kiefer, Ferenc. 2006. *Aspektus és akcióminőség: különös tekintettel a magyar nyelvre* [Aspect and Aktionsart: with particular attention to Hungarian]. Budapest: Akadémiai Kiadó.

Klein, Wolfgang. 1984. *Second Language Acqisition.* Cambridge: Cambridge University Press.

Klein, Wolfgang. 1994. *Time in language*. London: Routledge.

Klein, Wolfgang. 2009. How time is encoded. In Wolfgang Klein & Ping Li (eds.), *The expression of time*, 39–82. Berlin: de Gruyter.

Labov, William.1972. *Language in the inner city*. Oxford: Blackwell.

Lascarides, Alex & Nicholas Asher. 1993. Temporal interpretation, discourse relations and commonsense entailment. *Linguistics and Philosophy* 16(5). 437–493.

Levelt, William. 1989. *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.

Levinson, Stephen. 2000. *Presumptive meanings: The theory of generalized conversational implicature*. Cambridge, MA: MIT Press.

Lewandowsky, Stephan, Lisa Nimmo & Gordon Brown. 2008. When temporal isolation benefits memory for serial order. *Journal of Memory and Language* 58(2). 415–428.

Madden, Carol & Rolf Zwaan 2003. How does verb aspect constrain event representations? *Memory & Cognition* 31(5). 663–672.

Magliano, Joseph & Michelle Schleich 2000. *Verb aspect and situation models. Discourse Processes* 29(2). 83–112.

Mandler, Jean. 1986. On the comprehension of temporal order. *Language and Cognitive Processes* 1(4). 309–320.

Morrow, Daniel. 1990. Spatial models, prepositions, and verb-aspect markers. *Discourse Processes* 13(4). 441–469.

Münte, Thomas, Kolja Schiltz & Marta Kutas. 1998. When temporal terms belie conceptual order. *Nature* 395(6697). 71–73.

Ohtsuka, Keisuke & William Brewer. 1992. Discourse organisation in the comprehension of temporal order in narrative texts. *Discourse processes* 15(3). 317–336.

Owens, Jonathan & Marat Yavrumyan. 2007. The Participle. In Kees Versteegh (eds.), *Encyclopedia of Arabic Language and Linguistics*, 541–546. Leiden: Brill.

QUEST. 1996. Produced by Thomas Stellmach & Tyron Montgomery. Music: Wolfram Spyra. University of Kassel: Stellmach-Montgomery Production. An excerpt is available at http://stellmach.com/Webseiten/Quest/Quest_excerpt.html (accessed 28 March 2018).

Radvansky, Gabriel & David Copeland. 2006. Walking through doorways causes forgetting: situation models and experienced space. *Memory & Cognition* 34(5). 1150–1156.

Salaberry, Rafael. 2003. Tense aspect in verbal morphology. *Hispania,* 86(3). 559–573.

Schank, Roger & Robert Abelson. 1977. *Scripts, plans, goals and understanding.* Hillsdale, NJ: Erlbaum.

Simner, Julia & Martin Pickering & Alan Garnham. 2003. Discourse cues to ambiguity resolution: Evidence from "do it" comprehension. *Discourse Processes* 36(1). 1–17.

Simner, Julia & Martin Pickering. 2005. Planning causes and consequences in discourse. *Journal of Memory and Language* 52(2). 226–239.

Silva-Corvalán, Carmen. 1983. Tense and aspect in oral Spanish narrative: Context and meaning. *Language* 59(4). 760–780.

Schumann, John. 1987. The expression of temporality in basilang speech. *Studies in Second Language Acquisition* 9(1). 21–41.

Schmiedtová, Barbara. 2004. *At the same time...: the expression of simultaneity in learner varieties*. Berlin: de Gruyter.

Schmiedtová, Barbara & Natalya Sahonenko. 2008. Die Rolle des grammatischen Aspekts in Ereignis–Enkodierung: Ein Vergleich zwischen tschechischen und russischen Lernern des Deutschen. In Patrick Grommes & Maik Walter (eds.), *Fortgeschrittene Lernervarietäten: Korpuslinguistik und Zweitspracherwerbsforschung*, 45–71. Linguistische Arbeiten. Tübingen: Niemeyer.

Schmiedtová, Barbara. 2011. Do L2 speakers think in the L1 when speaking in the L2? *Vigo International Journal of Applied Linguistics* 8. 97–122.

Schmiedtová, Barbara. 2013. Traces of L1-patterns in the event construal of Czech advanced speakers of L2 English and L2 German. *International Review of Applied Linguistics in Language Teaching* 51(2). 87–116.

Swallow, Khena, Jeffrey Zacks & Richard Abrams. 2009. Event boundaries in perception affect memory encoding and updating. *Journal of Experimental Psychology: General* 138(2). 236–257.

Takács, E. 2012. A progresszív jelentéstartalom konstruálásának sajátosságai a magyarban [Idiosyncracies of the progressive aspect in Hungarian]. *Magyar Nyelvről* 136. 325–335.

ter Meulen, Alice. 2000. Chronoscopes: The dynamic representation of facts and events. In James Higginbotham, Fabio Pianesi & Achille Varzi (eds.), *Speaking of Events*, 151–168. Oxford: Oxford University Press.

Tomita, Naoko. 2013. Strategies for linking information by German and Japanese native speakers and by German learners of Japanese. *International Review of Applied Linguistics in Language Teaching* 51(2). 117–149.

Thieroff, Rolf. 1992. *Das finite Verb im Deutschen*. Tübingen: Narr.

van den Broek, Paul, Brian Linzie, Charles Fletcher & Chad Marsolek. 2000. The role of causal discourse structure in narrative writing. *Memory & Cognition* 28(5). 711–721.

van der Meer, Elke, Reinhard Beyer, Bertram Heinze & Isolde Badel. 2002. Temporal order relations in language comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 28(4). 770–779.

Vanek, Norbert. 2013. Event linearization in advanced L2 user discourse: Evidence for language-specificity in the discourse of Czech and Hungarian learners of English. In Leah Roberts, Anna Ewert, Miroslaw Pawlak & Magdalena Wrembel (eds.), *EUROSLA Yearbook 13*, 47–80. Amsterdam: John Benjamins.

Vanek, Norbert & Henriëtte Hendriks. 2015. Convergence of temporal reference frames in sequential bilinguals: Temporal structuring unique to second language users. *Bilingualism: Language and Cognition* 18(4). 753–768.

Vendler, Zeno. 1957. Verbs and times. *The Philosophical Review* 66(2). 143–160.

Von Stutterheim, Christiane, Mary Carroll & Wolfgang Klein. 2009. New perspectives in analyzing aspectual distinctions across languages. In Wolfgang Klein & Ping Li (eds.), *The expression of time,* 195–216. Berlin: de Gruyter.

Von Stutterheim, Christiane, Martin Andermann, Mary Carroll, Monique Flecken & Barbara Schmiedtová. 2012. How grammaticized concepts shape event conceptualization in language production: Insights from linguistic analysis, eye tracking data, and memory performance. *Linguistics* 50(4). 833–867.

Von Stutterheim, Christiane, Abbassia Bouhaous & Mary Carroll. 2017. From time to space: The impact of aspectual categories on the construal of motion events: The case of Tunisian Arabic and Modern Standard Arabic. *Linguistics* 55(1). 207–249.

Ward, Geoff, Lydia Tan & Rachel Grenfell-Essam. 2010. Examining the relationship between free recall and immediate serial recall: the effect of list length and output order. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 36(5). 1207–1241.

Zacks, Jeffrey, Barbara Tversky & Gowri Iyer. 2001. Perceiving, remembering, and communicating structure in events. *Journal of Experimental Psychology: General* 130(1). 29–58.

Zacks, Jeffrey & Barbara Tversky 2001. Event structure in perception and conception. *Psychological Bulletin* 127(1). 3–21.