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Case-matching effects under clausal ellipsis and the cue-based theory of sentence processing[1]

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This paper is concerned with case-matching effects under clausal ellipsis. We begin by considering available crosslinguistic data that indicate that variation in case marking on a fragment is delimited by the argument structure of the lexical head that assigns case to the fragment's correlate in the antecedent clause. We then offer experimental evidence for a case-matching preference in Korean when a fragment and its correlate may differ in case marking. This case-matching preference corresponds to a known case of mandatory case-matching in Hungarian, but their relationship is not predicted by any of the existing syntactic accounts of case-matching effects under clausal ellipsis. We propose a novel perspective on fragments that derives case-matching effects, including optional and mandatory case matching, from the predictions of cue-based retrieval. Two further acceptability judgment studies are offered in support of our proposal.

KEYWORDS: case-matching effects, cue-based retrieval, direct interpretation approach, fragments, Korean, movement-and-deletion approach

1. INTRODUCTION

This paper focuses on case-based identity constraints that hold between fragments and their antecedents. We propose a novel perspective on the morphosyntax of fragments, one that connects their morphosyntax to cue-based retrieval. We argue specifically that during the resolution of fragments, their morphosyntactic features

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aid in the process of retrieving target memory representations from among those that have been stored previously. To make this idea clearer, consider the licit and illicit B-responses in (1), which we term fragments.

(1) A: We traced this transfer to someone's restricted account.
B: Yes, Harvey's./Yes, *Harvey.

Fragments are stranded XPs whose semantics is propositional and that are considered to be instances of clausal ellipsis. We will not be making a further distinction in this paper between XPs that represent sluicing (wh-phrases like *who* in (2)) and those that represent fragment answers (non-wh-phrase XPs like *Harvey's* in (1)). Instead we will focus on what all fragments share, that is, morphosyntactic features they inherit from phrases to which they correspond in their antecedents. Notice that the fragments in (1B) must be genitive-marked, corresponding to the genitive-marked *someone's*. Phrases to which fragments correspond will be termed 'correlates' in the rest of this paper, following Merchant (2001) and the subsequent literature.

The intuition that fragments must match the case features of their correlates goes back to Ross (1969). He observed that languages with overt case marking systems require fragments to bear the same case features as those of their correlates. For instance, the German fragment depicted in (2) can only be marked for dative, just like its correlate.

(2) Er will jemandem schmeicheln, aber sie wissen nicht
he wants someone.DAT flatter but they know not
*wer/*wen/wem.
*who.NOM/*who.ACC/who.DAT.
'He wants to flatter someone but they don't know who.' (Ross 1969: 253)

This requirement of case matching is known as a connectivity effect such that the fragment appears to behave as if it was a constituent of a full clause, with its dative case being assigned by the same lexical head (the verb *schmeicheln*) that assigns dative to the correlate. Data like these have led to the proposal that fragments have unpronounced structure, and that their case features are licensed by the same syntactic mechanism that licenses case features of corresponding sentential constituents (Merchant 2001, 2004). However, there are reasons to believe that case matching effects don't follow straightforwardly from the presence of unpronounced material at the ellipsis site, if one accepts that such exists. To show this, we briefly illustrate below crosslinguistic examples where a verbal head assigns more than one case to its dependents.

Jacobson (2016: 356–359) argues for a mandatory case feature match between a fragment and its correlate as a characteristic of the syntax of question and answer sequences, without positing unpronounced sentential structure for fragments. She cites examples involving the Hungarian verb *hasonlit* 'resembles' where mismatch could in principle be available. Consider first the question with a sentential response in (3).

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(3) A: Ki-re hasonlit Péter? B: Péter hasonlit
A: who.SUBL resembles Péter B: Péter resembles
János-ra/János-hoz.
János.SUBL/János.ALL
'A: Who does Peter resemble? B: Peter resembles Janos.'

The verb *hasonlit* assigns either sublative (SUBL) or allative (ALL) case to its object NP, allowing the NP *János* in (3B) to be either sublative- or allative-marked. However, the allative option, mismatching the case of the correlate, is blocked for the fragments in (4B).

(4) A: Ki-re hasonlit Péter? B: János-ra/*János-hoz.
A: who.SUBL resembles Péter B: János.SUBL/*János.ALL
'A: Who does Peter resemble? B: 'Janos.'

This pattern is puzzling if we were to assume that the fragments in (4B) are sentential constituents bearing the case features appropriate for an NP object subcategorized for by the verb *hasonlit.* If this assumption was correct, then both allative and sublative should be available for the fragments. However, it is also incorrect to require case match for all pairs of fragments and correlates. One pattern that has emerged from the literature is that whenever the correlate's case features can vary, as determined by the subcategorizing lexical head in the antecedent, so can the fragment's case features, whether or not this results in case mismatch between the fragment and the correlate.

Relevant examples come from Bulgarian (Abels 2017), Korean (Kim 2015), and Icelandic (Wood, Barros & Sigurðsson 2020).[2] To illustrate, consider the Bulgarian examples in (5)–(6). A verbal object that is pronominal can receive either the general case (G) (*njakoi* 'someone' in (5)) or the non-subject case (NON-S) (*njakogo* in (6)) in a full clause. Regardless of which option is chosen for the verbal object in the antecedent, the fragments in (5) and (6) can also use either of the two cases, and this can result in case mismatch, shown in (5).

(5) Ivan sreshtna njakoi no ne znam kogo.
Ivan met someone.G but not I.know who.NON-S
'John met someone but I don't know who.'

(6) Ivan sreshtna njakogo no ne znam kogo.
Ivan met someone.NON-S but not I.know who.NON-S
'John met someone but I don't know who.'

Korean provides further examples of case mismatch. In (7) the antecedent hosts an accusative-marked wh-phrase (*mwues-ul*) serving as the correlate for the caseless fragment. The reverse is also possible: the fragment may be accusative-marked and

[2] But see Vicente (2015) for a longer list of languages where the case-matching requirement doesn't appear to hold under sluicing.

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the correlate caseless (due to the possibility of case drop from non-nominative-marked NPs in Korean nonelliptical clauses).[3] Combinations with matching case features are available, as well.

(7) A: Mimi-ka mwues-ul masy-ess-ni? B: Cwusu.
A: Mimi-NOM what-ACC drink-PST-QUE? B: juice
A: 'What did Mimi drink?' B: 'Juice.'

We are the first to provide experimental support for a robust preference for case match (noted informally in Abels 2017 for Bulgarian and in Wood et al. 2020 for Icelandic) in the event that the morphological marking on the fragment and its correlate can vary. This preference corresponds to the requirement of case match in Hungarian, as in (4), but neither of these is predicted on the assumption alone that a fragment's morphosyntactic features are licensed by the same lexical head that licenses the features of its correlate. Before proceeding, we should note that the Korean example in (7) differs from both the Bulgarian and Hungarian examples. In Korean case mismatch arises from the presence/absence of a case marker on the fragment or the correlate, while in Bulgarian and Hungarian it is due to different cases marked on the fragment and the correlate. This feature of Korean will allow us to test in more detail the predictions of cue-based retrieval (see Section 5 and the general discussion), which, as we argue here, captures the data above. On current cue-based retrieval models of sentence processing, the ease of resolving a dependency between a probe and a target is linked to the cue-specificity of the probe triggering the search for the target (McElree 2000; McElree, Foraker & Dyer 2003; Lewis & Vasishth 2005; Lewis, Vasishth & Van Dyke 2006; Van Dyke 2007; Van Dyke & McElree 2011; Van Dyke & Johns 2012; Caplan & Waters 2013). We argue that the probe's (i.e. the fragment's) case features are a cue relevant for this search, and we use this idea as a way of accounting for both the case-matching preference for fragments and the corresponding case-matching requirement in Hungarian. We further argue that, crosslinguistically, grammars have conventionalized case matching to facilitate the processing of fragments, as case-matching effects arise whether or not there is evidence for unpronounced structure for fragments (see Section 2.1). We limit our discussion to fragments whose correlates are arguments of some lexical head in the antecedent, leaving aside other cases (i.e. adjuncts) where the features of fragments and their correlates are not licensed syntactically by any elements of the antecedent.

[3] It should be noted here that Korean also permits case mismatch in only one direction: a caseless fragment and a case-marked correlate. This is the case for fragments whose correlates are nominative-marked, namely, the fragments may be either caseless or nominative. The correlates, however, which are embedded in full clauses, may not drop their nominative case markers. We don't discuss such fragments here any further but would like to point out that the option of being caseless that is available for fragments can not be attributed to any option available for nominative NPs in full clauses. This is problematic for movement-and-deletion approaches to fragments, which we discuss in detail in Section 2.1 (for more detail on fragments with nominative correlates, see Morgan 1989 and Nykiel & Kim 2022a).

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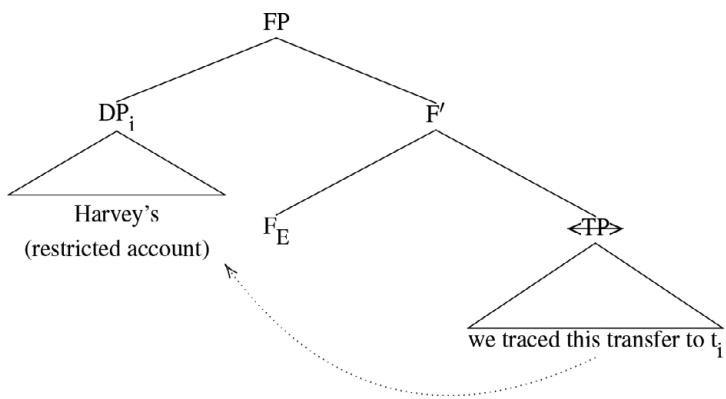
In the rest of this paper, we first provide more background on theoretical accounts of the case matching facts across languages, highlighting problems that they face (Section 2). In Section 3 we walk the reader through the assumptions of cue-based processing models and the reasons they predict case-matching effects. Section 4 demonstrates experimentally (via an acceptability judgment study) that case match is more acceptable in Korean than case mismatch in either direction (case-marked correlate and caseless fragment or vice versa), as is predicted by cue-based retrieval. Section 5 addresses a wrinkle in the Korean data that prevents us from assuming that all we observe in Korean fragments is the preference for case match. We present data from two acceptability judgment studies in this regard. Section 6 interprets our experimental results as evidence that case features are utilized in the cue-based search for the correlate that is initiated by the fragment. Section 7 concludes.

2. Accounts of case match

2.1 *Movement-and-deletion approach*

Case matching effects have received considerable attention within the strand of research that takes fragments to behave like constituents of full clauses (Ross 1969; Merchant 2001, 2004, and subsequent work). Discussions of these effects have focused on the idea that the fragment's morphosyntactic features should be appropriate for the grammatical function that its correlate serves in its syntactic structure, because the fragment is embedded in the corresponding structure that goes unpronounced in the course of the derivation (at PF). Example (8) illustrates the schematic derivation of the fragment in (1): fronting followed by PF-deletion of the TP the fragment has been fronted out of (based on Merchant 2004: 675).

(8)



While syntactic identity between the antecedent and the structure that embeds a fragment is not required on this approach (see Merchant 2001 for further discussion), in many cases these structures are identical down to the lexical head that assigns case to both the fragment and its correlate. Full syntactic identity is

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expected, for example, if the fragment's correlate is an argument XP that receives a unique overt case from a lexical head. Case matching effects are a natural consequence of this identity. We would predict in addition that whenever a lexical head can assign more than one case to a fragment's correlate, the same lexical head assigns these cases to the fragment, and hence the Bulgarian, Icelandic, and Korean possibilities of case mismatch (see Section 1) are captured correctly. This is the line of analysis that Wood et al. (2020) pursue for Icelandic. But the Hungarian facts given in (4) remain somewhat problematic. Wood et al.'s (2020) proposal leads them to suggest that no variation would be permitted for fragments if sublative and allative case markers were associated with either different syntax or argument structure. This suggestion has not been followed up on, to the best of our knowledge.[4]

However, the idea that case-matching effects follow from an identical lexical head assigning case to fragments and their correlates faces problems. This happens because the movement-and-deletion approach requires a legitimate sentential source for fragments, including both syntactically identical and nonidentical clauses, such as copular clauses. Several languages have been reported to require copular clause sources of the kind shown in ($9B_1$), either in addition to or instead of the syntactically identical ($9B_2$) (see Vicente 2018 for an overview of the range of syntactically nonidentical sources available for sluicing crosslinguistically).

(9) A: Harvey did a FaceTime photo shoot.
B_1: Yes, with a photographer he'd worked with before <it was>.
B_2: Yes, with a photographer he'd worked with before <Harvey did a FaceTime photo shoot>.

The status of copular clauses has been debated for those languages that permit both syntactically identical and copular clause sources. For instance, Van Craenenbroeck (2010) argued that copular clauses are only available as an alternative to syntactically identical sources as a 'last resort' option (for more discussion and other views, including equal availability of identical and nonidentical sources, as in Barros 2014; see also Merchant 2001; Weir 2014; Vicente 2018). Because this last-resort view lets syntactically identical sources take precedence over nonidentical ones, case-matching effects are expected to arise in fragments whenever the grammar makes a syntactically identical source available, but not necessarily so if it

[4] Wood et al. (2020: 433) offer an English example to illustrate how different syntax may enforce identity of fragments with their correlates. In (i), the prepositions *to* and *with* are associated with different syntax and, according to Wood et al., mismatch should be impossible.

(i) A: To whom was John talking?
B: *With Mary <John was talking>.

It is unclear whether it is impossible, given corpus data like (ii) reported in Miller (2014: 83), where the prepositions *about* and *of* are mismatched under pseudogapping.

(ii) Ask Doll, who spoke as much about his schoolboy career ending as he did of the season in general: 'I don't want it to end.'

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does not. The last resort option is activated in limited circumstances: for instance, as a means of accounting for phenomena such as the availability of preposition-drop (P-drop) from fragments and island repair. The first case is illustrated in (10).

(10) Juan ha hablado con una chica pero no sé cuál
Juan has talked with a girl but not know which
<es la chica con la que ha hablado Juan>.
<is the girl with the that has talked Juan>
'Juan has talked with a girl but I don't know which is the girl with whom Juan has talked.' (Rodrigues, Nevins & Vicente 2009: 178)

The problem here is that a language like Spanish disallows fronting of prepositional objects and would thus block (10) from being derived the way shown in (8), with movement of the prepositional object *cuál* 'which' while leaving behind the preposition *con* 'with'. To avoid this problem, Rodrigues et al. (2009) proposed an alternative source for fragments involving the copular clause depicted in (10), with the result that the fragment *cuál* 'which' doesn't move out of a PP.

However, crosslinguistic P-drop data challenge the link between case matching effects and the availability of sentential sources for fragments. The Greek example in (11), where the fragment must bear accusative case like its correlate, showing case matching effects, allows P-drop without allowing any legitimate sentential source (including a copular clause) for the fragment (see Molimpakis 2019 for experimental evidence and Nykiel 2013 for Polish data that pose the same problem for the movement-and-deletion approach).

(11) Sto proavlio I neari mathitria krivotan apo kapjous
In-the yard the young student was-hiding from someone.ACC
alla kanis den katalave pjous/*pji.
but no-one.NOM NEG realized who.ACC/*who.NOM
'In the yard the young student was hiding from someone, but no one realized who.'

Given the movement-and-deletion approach, it is unclear why case matching effects should arise here at all and what lexical head licenses the accusative case on the fragment. Case assignment appears to happen nonlocally, being mediated by the preposition present only in the antecedent (see Section 2.2 for how nonlocal case assignment is implemented in the direct interpretation approach to clausal ellipsis).

With respect to island repair, the movement-and-deletion approach has difficulty explaining why fragments are able to repair island violations. This ability is entirely unexpected given that fragments should behave like constituents of full clauses. The usual explanation for these facts is found in Merchant (2001, 2004, 2008), who proposes that islands are PF phenomena, that is, that if all island-violating nodes are deleted in the course of the derivation, the final result is well-formed. But another proposal (Barros, Elliott & Thoms 2014) assumes that island repair doesn't exist because syntactically nonidentical, island-avoiding, sources can be used for

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fragments to circumvent island repair. These sources include copular clauses, as well as what Barros et al. 2014 term 'short sources'. Copular clauses are difficult to reconcile with case-matching effects in languages with overt case marking systems: as shown in (12) from Polish, the case marked on the fragment must be matched with that marked on the correlate, while a copular clause source would wrongly require the fragment to bear nominative case (13).

(12) Adrian spotkał swoich studentów w Kalifornii, ale nie chce
Arian met his students.ACC in California but not he.will
powiedzieć których/*którzy.
say which.ACC/*which.NOM
'Adrian met his students in California but he won't say which.'

(13) Adrian spotkał swoich studentów w Kalifornii, ale nie chce
Arian met his students.ACC in California but not he.will
powiedzieć *których/którzy <to byli>.
say *which.ACC/which.NOM it were
'Adrian met his students in California but he won't say which (it was).'

Short sources appear to fare better at first sight. Consider the fragment in (14) from Merchant (2001: 209) and its sentential short source in (15).

(14) They hired someone$_i$ who speaks a Balkan language – guess which!

(15) They hired someone$_i$ who speaks a Balkan language – guess which he$_i$ speaks!

Example (15) is meant to provide an alternative source for this fragment that avoids violation of a relative clause island depicted in (16).

(16) *They hired someone$_i$ who speaks a Balkan language – guess which (Balkan language) they hired someone that speaks!

Unlike copular clauses, a short source is also able to capture case matching effects, as seen below in the Polish counterpart of (15).

(17) Zatrudnili kogoś, kto mówi jakimś bałkańskim językiem –
they.hired someone that speaks a Balkan language.INSTR –
zgadnij którym mówi.
guess which.INSTR he.speaks

Barros et al. (2014: 9) argue, however, that similar English examples of island-escaping fragments must have copular sources. This is the case when the antecedent hosts a negative indefinite and the fragment is well-formed, as in (18).

(18) They didn't hire anyone who speaks a certain Balkan language, but I don't remember which!

The corresponding short source is bad (19), while a copular source (20) is fine.

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(19) *They didn't hire anyone who speaks a certain Balkan language, but I don't remember which he speaks.

(20) They didn't hire anyone who speaks a certain Balkan language, but I don't remember which it was.

Thus the Polish counterpart of (18) depicted in (21) would have no licit sentential source, while still showing case matching effects.

(21) Nie zatrudnili nikogo, kto mówi jakimś bałkańskim językiem,
not they.hired anyone that speaks a Balkan language.INSTR
ale nie pamiętam którym.
but not I.remember which.INSTR

The lack of a short source here brings us back to the problem we noted above, namely, that copular sources have no ability to capture case matching effects in languages with overt case marking.

In sum, the movement-and-deletion approach has no account of the Hungarian facts. Additionally, this approach permits syntactically identical and nonidentical sources for fragments but must limit the application of the latter to fit in with the assumption that case matching effects require, namely, that the morphosyntactic features of fragments are licensed by the same lexical heads that license the morphosyntactic features of their correlates. And even if nonidentical sources for fragments are allowed in limited circumstances, this still leaves crosslinguistic data showing case matching effects (see the Greek (11) and Polish (21) examples without sentential sources) unaccounted for. We now turn to a theoretical alternative that allows fragments to be stand-alone phrases rather than constituents of full clauses.

2.2. *Direct interpretation approach*

This approach is characterized by the assumption that fragments are generated not as clausal constituents, but as stand-alone phrases with propositional semantics. This makes the process of assigning appropriate features to them somewhat more stipulative in nature than is the process of assigning such features to clausal constituents on approaches involving movement and deletion. Semantic and morphosyntactic features of fragments must be licensed nonlocally, that is, by reference to the surrounding context. This idea has primarily been fleshed out within the frameworks of Simpler Syntax (Culicover & Jackendoff 2005) and Head-driven Phrase Structure Grammar (HPSG) (Ginzburg & Sag 2000).[5] The surrounding context supplies an antecedent expressing a proposition that constitutes the basis for interpreting the fragment. The fragment is first matched to a target constituent (its correlate) in the syntactic representation of the antecedent and then integrated into

[5] But see also the direct interpretation analyses offered in Ginzburg (2012) and Jacobson (2016).

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the proposition expressed by the antecedent. Because the fragment has a matching constituent in the antecedent clause, it inherits all of the semantic and morphosyntactic features that are appropriate for that constituent. This is what Culicover & Jackendoff (2005) term 'indirect licensing' of the fragment's linguistic features. To the best of our knowledge, the idea that the fragment is assigned the same morphosyntactic features that are licensed for the constituent to which is matched goes back to Levin's (1982) Lexical Functional Grammar account of sluicing. Aligning the morphosyntactic features of fragments and their correlates is the only place where antecedent syntactic structure plays a role in the resolution of fragments, as opposed to the process of reconstructing antecedent structure at the ellipsis site on the movement-and-deletion approaches. But the details of licensing the morphosyntactic features of the fragment differ between the Simpler Syntax and HPSG accounts.

Culicover & Jackendoff (2005: 265) don't directly require that the fragment and its correlate have matching case and/or syntactic category features. Their mechanism for licensing fragments is given in (22).

(22) Syntax: $[_U \, \mathrm{XP}_i \, ^{ORPH}]^{IL}$
Semantics: $[F(\mathrm{X}_i)]$

Syntactically, there is an U(tterance) whose only constituent is a stranded XP.[6] The annotations ORPH (for orphan) and IL (for indirect licensing) identify the fragment as subject to the indirect licensing process. The fragment is only semantically coindexed with its correlate in the antecedent, without directly sharing with it its morphosyntactic features. This allows nonidentical case features for the fragment and the correlate so long as more than one case is licensed for the correlate. We can thus account for mismatched cases in the Bulgarian ((5) and (6)) and Korean (7) examples that we saw in the Introduction. It's less clear how one would enforce case matching in the Hungarian example (4) using only semantic coindexation.

Ginzburg & Sag (2000: 304) articulate a stronger condition on fragments that predicts the Hungarian facts, along with the known cases of mandatory case matching that Ross (1969) identified. Their condition requires that all morphosyntactic features be shared between the fragment and its correlate (as we saw in the Introduction, the same assumption is found in Jacobson's (2016) account of fragments, including the Hungarian facts depicted in (3)–(4)). Example (23) illustrates Ginzburg and Sag's constraint on fragments (i.e. headed-fragment phrases) such that the head daughter (H) must correspond to the constituent termed Salient Utterance (SAL-UTT), which is supplied by the context (CTXT) as part of the antecedent's syntactic representation and serves as the fragment's correlate.

[6] This construction licenses fragments consisting of non-wh-phrases. The one that licenses stranded wh-phrases (sluicing) assumes that they are sole constituents of S, not U, to capture the fact that the distribution of sluicing fragments closely tracks that of interrogative clauses, see Culicover & Jackendoff (2005: 270).

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(23) Headed-Fragment Phrase

$$\begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{verb} \\ \text{VFORM} \quad \textit{fin} \end{bmatrix} \\ \text{SUBJ} & \langle \quad \rangle \\ \text{CTXT}\,|\,\text{SAL-UTT} & \left\{ \begin{bmatrix} \text{SYN} & [\text{CAT}\,|\,\text{HEAD} \quad \boxed{1}] \\ \text{SEM} & [\text{INDEX} \quad i] \end{bmatrix} \right\} \end{bmatrix} \rightarrow \mathbf{H} \begin{bmatrix} \text{SYN} & [\text{CAT}\,|\,\text{HEAD} \quad \boxed{1}] \\ \text{SEM} & [\text{INDEX} \quad i] \end{bmatrix}$$

Morphosyntactic identity between the SAL-UTT and the fragment is ensured via the mandatory sharing of syntactic category (CAT) features, including case features where appropriate. However, (23) can't adequately capture, without additional stipulations, the freedom that Bulgarian, Icelandic, and Korean fragments have in terms of their morphological marking. There is a way to relax it just enough that variation in case marking is permitted by requiring no more than identical semantic indexes on the fragment and the correlate, as Culicover & Jackendoff (2005) do in (22). If the correlate is a member of the argument structure of a lexical head in the antecedent (in HPSG terms this means that the correlate is an element on the lexical head's ARG-ST list, which includes all its canonical and noncanonical arguments), then coindexing the fragment with that constituent should have the right results: the fragment will inherit whatever morphological marking is available for its correlate.[7]

In sum, neither Ginzburg & Sag's (2000) nor Culicover & Jackendoff's (2005) analysis correctly predicts all of the available data, although each predicts some data. What is needed is a better understanding of why case-matching effects arise and when case mismatches are permitted at all. We address the former question in the next section and the latter in Section 5.

3. CUE-BASED RETRIEVAL

The crosslinguistic examples we have discussed thus far demonstrate the relevance of argument structure for the well-formedness of fragments. In the event that a fragment's correlate is an argument of some lexical head in the antecedent, the fragment may bear any features that are licensed for that argument. Now, the question is why a feature match between the fragment and the correlate is preferred over mismatch if both are permitted by the grammar. To answer this question we turn to the cue-based theory of sentence processing.

But before proceeding, it is important to note that the direct interpretation analyses we reviewed in the previous section make certain predictions from a processing perspective. Culicover & Jackendoff's (2005) mechanism of indirect

[7] The details of this idea are fleshed out in an HPSG account in Nykiel & Kim (2022a).

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licensing predicts a search for a fragment's correlate as part of aligning the two.[8] However, the fragment's morphosyntactic features do not play any active role in this search. The correlate is identified based on its own and the fragment's semantics in a process that picks out the target semantic representation from among the representations previously constructed in memory on the basis of the antecedent. Once the fragment and the correlate are aligned, the former must also satisfy the relevant morphosyntactic identity requirements. Ginzburg & Sag's (2000) account, alternatively, suggests that both semantic and morphosyntactic information encoded in the fragment guides the search for the correlate. Ginzburg (2012) proposes two directions in which the search can proceed: forward and backward. In a forward search, an antecedent anticipates incoming fragments and preselects correlates for them. This direction is plausible, for instance, for antecedents that are wh-interrogatives, where wh-phrases can be viewed as likely candidates for correlates. In a backward search, encountering a fragment initiates a search for its correlate in the preceding discourse. We defend the backward direction here, which assimilates the retrieval of correlates for fragments to processes that are typically associated with memory retrieval, such as pronoun resolution or word recognition. We will argue specifically that a fragment's morphological features aid in a backward search for its correlate by virtue of bearing the same case features as the intended correlate, an idea that is consistent with the cue-based theory of sentence processing.

One kind of linguistic data that cue-based parsing models have been successfully applied to involve nonlocal dependencies, where the processor faces the task of having to retrieve previously stored representations from memory upon encountering constituents that depend on them for their interpretation. This type of memory retrieval has been argued to be cue-based in the sense that it engages a direct-access mechanism, whereby all extant memory representations are simultaneously compared against the dependent constituent until a match is found (McElree 2000; McElree et al. 2003; Lewis & Vasishth 2005; Lewis et al. 2006; Van Dyke & McElree 2006, 2011; Van Dyke & Johns 2012; Caplan & Waters 2013). The key component of the direct-access mechanism is that there is no serial search through the memory representations and that successful retrieval relies on the diagnosticity of the retrieval cues supplied by the constituent that initiates the retrieval. Cue diagnosticity of a retrieval probe is defined relative to distractors, i.e. competing material that has been processed and stored in memory and that can give rise to interference. That is, a retrieval probe may share a number of linguistic features with the target representation and none, or fewer, with distractors, making the target representation distinct and more easily accessible during retrieval. If, however, the probe, the target representation and distractors all share some linguistic features, the cue diagnosticity of the probe is reduced, which slows down the retrieval and can

[8] See also Goldberg & Perek (2019) for an outline of a Construction Grammar analysis of ellipsis where ellipsis, like pronominal anaphora, is resolved via a mechanism that points back to a target phrase in the antecedent, building on Martin & McElree's (2011) proposal (see below).

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lead to a distractor being misidentified as the target representation, a phenomenon known as cue overload (Watkins & Watkins 1975; Nairne 2002; Öztekin & McElree 2007; Martin 2018). As we will see below, studies exploring interference effects have provided evidence for the involvement of morphological information in a cue-based search for a target representation during retrieval.

Cue-based parsing models have been tested on ellipsis because syntactically impoverished forms depend on the surrounding context to supply an appropriate semantics for them. When resolving ellipsis generally, the task is to find the antecedent clause in the surrounding context that supplies the information needed for resolution. In the case of fragments, the first task is to interpret the fragment and find the correlate for it and the next is to integrate the fragment into the same proposition that its correlate is part of (Culicover & Jackendoff 2005; Harris & Carlson 2019).[9]

Consistent with cue-based retrieval, the task of locating the correlate for the fragment has been shown to engage a direct-access mechanism rather than a serial search (Martin & McElree 2011). Martin & McElree (2011) demonstrated that this holds true of English sluicing (a construction included in what we term fragments here), because the time needed to resolve the fragment *what* in (24) was not affected by the linear order of the VPs in the antecedent clause. If a serial search for the correlate was involved instead of a direct-access mechanism here, the order in (24) should lead to a slowdown compared to the reverse order of the VPs (*typed something and drank coffee*) where the correlate *something* is located earlier in the antecedent clause.[10]

(24) Michael drank coffee and typed something but he didn't tell me what.

Of interest to us is that Martin & McElree (2011) left it open what linguistic information encoded in a fragment serves as retrieval cues. This was due to the limited availability of morphosyntactic information in English fragments. However, a more recent study of sluicing found that the retrieval of a correlate is facilitated by attaching explicit linguistic information to a fragment (Harris 2015). The finding is specifically that partially specified fragments (*which ones* in (25)) contrast with fully specified fragments (*which tourists* in (26)) in being read slower and incurring more interference from non-target representations.

[9] We make the simplifying assumption here that there always is a correlate, whether expressed overtly or covertly in the antecedent, for a fragment. But there are cases where a fragment has no obvious correlate and the link between it and the antecedent is purely semantic/pragmatic, as in (i) (see also Culicover and Jackendoff (2005) for more examples).

(i) A: Can you show us the R command again? B: One sec!

[10] Martin & McElree (2008, 2009) also demonstrated that distance between an ellipsis and antecedent and the complexity of the antecedent does not affect the speed with which Verb Phrase ellipsis is processed, but increased distance and complexity compromise the accuracy of comprehending Verb Phrase ellipsis. Martin & McElree (2011) observed reduced comprehension accuracy under the same conditions in sluicing, as well.

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(25) Some tourists sampled the wines but I've forgotten which ones.

(26) Some tourists sampled the wines but I've forgotten which tourists.

Interference effects were induced by NPs occupying a local (i.e. object) position, while the intended correlate was located in the more distant subject position.[11] They were enhanced when a fragment like *which ones* in (25) agreed in number with both the subject and object NPs but could only be resolved to *tourists*, taking the subject NP as its correlate, because sluicing typically permits only indefinite NPs to be correlates. A fully specified fragment like *which tourists* in (26), however, provided unambiguous pointers to its subject NP correlate, reducing interference effects. This pattern of results indicates that the parser uses both morphological and semantic information encoded in a fragment as retrieval cues as it accesses the fragment's correlate. Furthermore, the more linguistic features the fragment shares with its correlate, the greater the specificity of the retrieval cues it provides.

In their ERP study of Noun Phrase ellipsis in Spanish, Martin, Nieuwland & Carreiras (2012) provided evidence that the gender specification of a determiner that precedes an ellipsis impacts the search for the correlate. For instance, in (27) the determiner *otra* is feminine and agrees with the gender of the intended correlate (*camiseta*) but not with that of the intervening distractor noun (*vestido*).

(27) Marta se compró la camiseta que estaba al lado del vestido
Marta REFL bought the t-shirt.F that was next to the dress.M
y Miren cogió otra para salir de fiesta.
and Miren took another.F to go out to the party
'Marta bought the t-shirt that was next to the dress and Miren took another to go to the party.'

Martin et al. (2012) reported processing difficulty for cases like (27), compared to cases where the gender of the determiner overlapped with the genders of both the target and the distractor. This effect also reflects a locality preference (see Note 11), that is, an expectation that the correlate is the NP located nearest the ellipsis, and if the morphological specification of the head noun within that NP conflicts with the morphological specification of the determiner probe, then processing difficulty may arise. These results depart from Harris's (2015) in terms of the source of the interference effects: conflicting case specifications of the local noun and the determiner probe should have optimized the search for the target phrase rather than hinder it. However, these results also confirm that the processor relies on morphological information during its search for the correlate. In sum, while it continues to be debated what kind of linguistic information exactly is employed as cues during cue-based retrieval, including where ellipsis is involved, it already is clear that morphological information plays a role in addition to syntactic and semantic information (see also Parker, Schvartsman & Van Dyke 2017 for an overview).

[11] For evidence that there is a locality preference under sluicing such that correlates located nearest to the ellipsis site are favored over more distant ones, see Harris (2015) and references therein.

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We propose here that case features serve as retrieval cues in the resolution of fragments and that there are certain functional pressures on the parser during cue-based retrieval. Given that a fragment's correlate must be located and that it is an argument of some lexical head in the antecedent bearing certain morphosyntactic features licensed by that head, the fragment's task is to point to the correlate. The most efficient way to do so is by providing maximally specific retrieval cues, that is, features that overlap with those of the correlate so that potential interference from distractors is minimized. This task is straightforward in the event that the correlate can only be assigned one case: the fragment will then bear the same morphological marking as its correlate (note that this is also predicted by both kinds of syntactic theories of case-matching effects discussed above). If, alternatively, the grammar permits more than one kind of case marking for the correlate and any of the licit markings are also available for the fragment, the most efficient combination from the processing perspective are matching cases on the correlate and fragment. This follows as a logical consequence of construing the resolution of fragments as cue-based retrieval, with the additional assumption that the parser is subject to the pressure to maximize the cue diagnosticity of a probe.[12]

So far we can account for the case-matching preference, but what about the mandatory case matching between fragments and their correlates in Hungarian? We can construe it as an extreme case of the case-matching preference, that is, an instance of conventionalization of this preference. If efficient processing prioritizes unobstructed access to correlates via matching case specifications during cue-based retrieval, this could put pressure on the grammar to require case matching rather than permit it merely as a preferred option among other alternatives. And the grammar's response could be to conventionalize the preference as a grammatical constraint. We conjecture that this is what has happened in Hungarian.[13] That preferences observed in language processing can be redefined as grammatical constraints is clear from well-documented correspondences between options that are preferred over other options in some languages and grammatical requirements in other languages (see Hawkins 2004 and 2014 for crosslinguistic evidence and his

[12] An anonymous referee points out that while the preference for case matching is compatible with cue-based retrieval, it is just as compatible with syntactic priming effects (Bock 1986; Pickering & Branigan 1998; Branigan, Pickering & Cleland 2000; Sturt, Keller & Dubey 2010) and structural parallelism effects, which arise in ellipsis (Carlson 2002; Nykiel 2017; Kim & Runner 2018; Parker 2018; Harris & Carlson 2019; Nykiel & Hawkins 2020) and outside of it (Frazier et al. 1984; Dubey, Sturt & Keller 2005; Callahan, Shapiro & Love 2010). We concede that a case-matching preference alone constitutes insufficient evidence to distinguish between these accounts. However, we will see in Section 4 that the full set of results of Experiment 1 reveals not only the case-matching preference, but also an interaction between the main effects such that mismatched fragments and correlates are better when fragments are caseless than when they are case-marked. This interaction speaks to cue-based retrieval in favor of the other options, because acceptability differences between mismatch conditions are only predicted by cue-based retrieval, as discussed in Section 5.

[13] It is interesting to note that the data Jacobson (2016: 356n20) reports on reveal some speaker variation, with a few of the speakers actually allowing case mismatch. This would suggest that case matching is not (yet) a grammatical constraint for these speakers.

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Grammar-Performance Correspondence Hypothesis). Briefly, Hawkins (2004, 2014) argues that preferences that are visible in psycholinguistic experimentation and corpus studies can be subsumed under three principles of efficient language processing: Minimize Domains, Minimize Forms, and Maximize Online Processing. These principles capture patterns of preference in languages permitting variation (e.g. in word order), but, in languages with no variation in the corresponding areas, they predict that the applicable grammatical constraints are the same as the preferred patterns in the former languages.

In the next section we offer experimental evidence for the case-matching preference in Korean in support of cue-based retrieval. We explore the expected preference patterns with judgments of acceptability and extend our results to language processing in light of previous research that has explored parallels between judgments of acceptability and processing difficulty. First, judgments of acceptability vary in parallel with processing times, as has been demonstrated by Hofmeister et al. (2013) outside of ellipsis. Of yet more relevance to us is that judgments of acceptability can be predicted by a cue-based model of sentence processing based on different degrees of match between a probe and a target, as has been demonstrated by Parker (2018) for Verb Phrase ellipsis. In other words, our high acceptability ratings are a likely reflection of low processing difficulty that is due to a high degree of match between a probe and a target. We leave more direct testing of this correspondence for future research.

4. Experimental evidence for the case-matching preference

This section reports on an experiment that exploits the possibility for manipulating the morphological specifications of both fragments and their correlates in Korean, which is localized to structural case markers (accusative, genitive, and nominative) (see Kim 2016).[14] Such manipulations lead to either identical or nonidentical case specifications between a fragment and its correlate, and we hypothesized that identical case specifications are favored over nonidentical ones.

4.1 *Experiment 1: Match is better than mismatch*

Recall example (7), which permits optional case drop from the correlate and from the fragment so that four different pairings, two matching ((28) and (29)) and two

[14] Structural case markers have been argued by Kim (2016) to be specified at the constructional level in the sense of Goldberg (1995, 2006), rather than at the lexical level, that is, any NP that fills a given slot in a syntactic structure receives the case required by that slot. Case markers that will be assigned to particular slots in a structure are thus predictable from the structure. The predictability of structural case markers is also argued for in Lee (2016), who claims specifically that the more predictable an NP's syntactic function is the more likely it is to drop its structural case marker. Lee's account captures the patterns of preference observed in case drop from subject and object NPs in full clauses such that case drop tends to affect NPs appearing in their canonical positions.

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mismatching ((30) and (31)), of them are available. These four pairings illustrate our four experimental conditions: Match (Match, Mismatch) × Case (Caseless fragment, Case-marked fragment).

(28) A: Mimi-ka mwues masy-ess-ni? B: Cwusu.
A: Mimi-NOM what drink-PST-QUE? B: juice
A: 'What did Mimi drink?' B: 'Juice.' Match, Caseless fragment

(29) A: Mimi-ka mwues-ul masy-ess-ni? B: Cwusu-lul.
A: Mimi-NOM what-ACC drink-PST-QUE? B: juice-ACC
A: 'What did Mimi drink?' B: 'Juice.' Match, Case-marked fragment

(30) A: Mimi-ka mwues masy-ess-ni? B: Cwusu-lul.
A: Mimi-NOM what drink-PST-QUE? B: juice-ACC
A: 'What did Mimi drink?' B: 'Juice.' Mismatch, Case-marked fragment

(31) A: Mimi-ka mwues-ul masy-ess-ni? B: Cwusu.
A: Mimi-NOM what-ACC drink-PST-QUE? B: juice
A: 'What did Mimi drink?' B: 'Juice.' Mismatch, Caseless fragment

4.1.1 *Method and procedure*

We constructed twelve sets of experimental items following the 2×2 design, which crossed Match and Case, as in (28)–(31).[15] The items were rotated across four stimulus lists such that no participant saw more than one item from a single set. There were twelve items in each list, interspersed with twenty-four fillers. Acceptability ratings were delivered on a 7-point scale. A total of 24 college students, all self-reported monolingual speakers of Korean, participated in the experiment in exchange for entry in a lottery. See the Appendix for the full set of experimental items.

4.1.2 *Results and discussion*

We fit the data to an ordinal mixed effects model, using the *ordinal* package, that included Match and Case as fixed effects and the maximal random effects structure that was justified by the data (random intercepts and slopes for participants and items). Conditions were treatment-coded in accordance with our hypotheses and contrasts were considered significant at $p<0.05$.[16] The raw means and standard deviation measures for all conditions are provided in Table 1.

[15] Our experimental items use two structural case markers, accusative and genitive, marked on non-subject NPs (accusative) or on constituents of subject NPs (genitive). We didn't include nominative, because its omission from subject NPs would lead to ungrammaticality or at least interpretational ambiguity between nominative and genitive, which would have confounded our results.

[16] Both here and in the remaining two experiments, we also fitted a generalized additive mixed-effects model to the data (using the *mgcv* package v1.8-35, Wood 2021), with raw acceptability

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	Condition	Mean	SD
Exp. 1	Match	6.5	0.97
	Mismatch	6.3	0.95
	Case-marked fragment	6.2	1.14
	Caseless fragment	6.6	0.68
Exp. 2	Caseless fragment	3.9	1.43
	Case-marked fragment	5.2	1.34
Exp. 3	Implicit	4.9	1.50
	Overt	6.3	0.77
	Case-marked fragment	6.4	0.87
	Caseless fragment	5.2	1.40

Table 1
Raw means and standard deviations for all experimental conditions in Experiments 1–3.

We observed the main effect of Match, such that pairs of mismatched fragments and correlates received lower ratings than pairs of matched ones ($\beta = -1.49, SE = 0.57, z = -2.59, p < 0.01$). We didn't observe any reliable acceptability difference between caseless and case-marked fragments independent of the realization of the correlates, although caseless fragments trended in the direction of lower acceptability than case-marked fragments ($\beta = -0.55, SE = 0.59$, $z = -0.93, p = 0.35$). However, there was a statistically significant interaction between Match and Case. Mismatch conditions were judged better when fragments were caseless and correlates were case-marked than when fragments were case-marked and correlates caseless ($\beta = 2.7, SE = 0.86, z = 3.11, p < 0.01$). Pairwise comparisons conducted using the *emmeans* package reveal that there was no reliable difference between caseless and case-marked fragments for the Match conditions ($\beta = 0.55, SE = 0.59, z = 0.93, p = 0.35$), but case-marked fragments were worse than caseless fragments for the Mismatch conditions ($\beta = -2.15, SE = 0.62$, $z = -3.48, p < 0.001$). Estimated marginal means and standard errors for these conditions are reported in Table 2.

These results confirm that matching case specifications of fragments and correlates are better, but they also reveal that not all mismatches are equally degraded. The next section addresses the question of why additional acceptability differences should arise in cases of mismatch.

5. Why and where is case mismatch possible?

Experiment 1 has shown that the predictions of cue-based retrieval are supported by significantly higher acceptability ratings for fragments with matching correlates

scores and the same random-effects structure. The patterns of results in each case paralleled those reported in the main text.

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	Case	Mean	SE
Match	Case-marked fragment	5.5	0.77
	Caseless fragment	5	0.74
Mism.	Case-marked fragment	3.5	0.66
	Caseless fragment	6.5	0.82

Table 2
Estimated marginal means and standard errors (confidence level 0.95) for Match and Mismatch conditions in Experiment 1.

than for both mismatched conditions. This pattern of ratings also supports a general priming mechanism or a preference for structural parallelism (see Note 12). However, we still need to explain why the two mismatched conditions differed in acceptability such that caseless fragments were better than case-marked fragments. No such difference is predicted by priming or structural parallelism accounts, and we can ask, therefore, whether it follows from cue-based retrieval just like the case-matching preference itself. An anonymous referee suggests that caseless fragments are easier to process because they encode no morphological cues to send the parser on a search for a representation with matching morphological specifications. In contrast, case-marked fragments do send the parser on a search for a representation with matching morphological specifications that is, however, unavailable. Therefore, case-marked fragments with caseless correlates should be degraded compared with matching fragments and correlates, while caseless fragments with case-marked correlates should be as acceptable as matching fragments and correlates.[17] As these patterns were not supported by the main effect of Match in our data, we turn to another possibility.

We suggest that the advantage enjoyed by caseless fragments reflects another aspect of the interaction between fragments and their correlates. In Section 3 we saw that retrieval is facilitated when a fragment carries explicit linguistic information that matches the correlate. Does this mean that the responsibility of ensuring successful retrieval lies primarily with the fragment? Research on nominal anaphora has shown that phrases associated with different degrees of accessibility are retrieved by anaphors that vary in explicitness (Ariel 1990; Gundel, Hedberg & Zacharski 1993; Karimi et al. 2014; Troyer, Hofmeister & Kutas 2016). The accessibility of an antecedent for future retrieval and the explicitness of an anaphor selected to retrieve it are inversely proportional such that a highly accessible antecedent tends to be paired with a less explicit anaphor (e.g. a pronoun) and, conversely, a low-accessibility antecedent tends to be paired with a more explicit

[17] We remain skeptical about whether we should expect no acceptability difference between matching fragments and correlates and pairs of caseless fragments and case-marked correlates. If the parser relies on morphological, semantic, and syntactic specifications in its search for a target representation (as discussed in Section 3), then the more overlapping specifications there are between the probe and the target the easier the search should become. Match should always be better than mismatch.

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anaphor (e.g. an NP). We can conclude from these patterns that the job of facilitating retrieval is shared by antecedents and anaphors, that is, an anaphor can encode all of the linguistic content of its antecedent by repeating it exactly, or only a subset of its linguistic content. Which option is chosen will depend on the ease of retrieving the antecedent, given its accessibility. We follow Karimi et al. (2014) in defining the accessibility of a phrase as a function of the amount of linguistic information attached to that phrase. Let us now see what this research predicts for fragments.

The difference between case-marked fragments and caseless ones is not a difference of case, but rather a difference in explicitness such that caseless fragments are a subset of case-marked fragments. Hence, when speakers make a choice between a caseless fragment and a case-marked one, given a case-marked correlate, they are making a choice in terms of how much content to give to the fragment. This choice should be determined by the perceived accessibility of the fragment's correlate. By our definition of accessibility, a case-marked correlate carries more linguistic information than a caseless one, and is, therefore, more accessible. A pairing of a case-marked correlate and a caseless fragment is, in other words, the expected pairing of an accessible antecedent and a less explicit anaphor. Nykiel & Hawkins (2020) explicitly make this point in relation to fragments, based on English and crosslinguistic data, when they argue that speakers tend to choose more explicit forms of fragments in environments that may be considered difficult to process.[18]

One such environment is a fragment with an implicit correlate (a type of clausal ellipsis known as sprouting) depicted in (32), as opposed to a fragment with an overt correlate (see (28)–(31)). It has been suggested that Korean doesn't permit caseless fragments with such implicit correlates (Kim 2015).

(32) A: Chelswu-ka pat-ass-ney. B: Ung, sangkum-ul.
A: Chelswu-NOM receive-PST-DECL B: yes, prize-ACC
'(int.) Chelswu received (something).' B: 'Yes, a prize.'

This contrast between overt and implicit correlates nicely illustrates how a phrase's accessibility is impacted by the amount of linguistic information attached to it. An implicit phrase has no linguistic content and is therefore at a disadvantage compared

[18] Nykiel & Hawkins's (2020) argument is based on the possibility of dropping prepositions from English fragments (as in (i)), which can be viewed as equivalent to dropping case markers from Korean fragments. The explicitness of fragments is determined here by whether or not they contain prepositions.

(i) A: The bar's owners boarded the windows with something. B: What?/With what?

Note that prepositions may not be dropped if fragments lack overt correlates, as in (ii).

(ii) A: The bar's owners boarded the windows. B: *What?/With what?
Nykiel & Hawkins (2020) propose these patterns can be captured by Hawkins's (2004) principle of Minimize Forms, which reflects they way speakers manipulate the explicitness of linguistic forms (including anaphors), depending on the level of processing difficulty involved.

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to a phrase with overt linguistic content in the sense that a mental representation created for the latter in online processing is stronger. It has been shown that the more overt (i.e. semantically and syntactically explicit) a phrase the stronger its mental representation and the greater its accessibility for future retrieval from memory (Craik & Lockhart 1972; Craik & Tulving 1975; Fisher & Craik 1980; Hofmeister 2007, 2008, 2011; Hofmeister et al. 2007; Gallo et al. 2008; Hofmeister et al. 2013; Karimi et al. 2014; Troyer et al. 2016). An overt correlate is always a more accessible retrieval target than an implicit correlate regardless of the diagnosticity of the retrieval cues provided by the fragment. So if caseless fragments are indeed the less explicit forms of fragments, they should be better with overt correlates than with implicit ones like (32) because of the low accessibility of these correlates. We test and confirm this hypothesis in Experiments 2–3 below.

Turning now to the condition that received the lowest ratings in Experiment 1, it would seem that using case-marked fragments with caseless correlates should reflect the tendency to provide explicit anaphors for low-accessibility antecedents and incur no more of a penalty than caseless fragments and case-marked correlates do. We suspect, however, that because case-marked fragments provide conflicting retrieval cues, which neither match exactly, nor are a subset of, the information encoded by their caseless correlates, they lead to processing difficulty. We leave it for future research to explore whether our guess is on the right track.

5.1 *Experiment 2: With implicit correlates, case-marked fragments are better than caseless fragments*

In this experiment, we manipulated the morphological specifications of fragments, while all correlates were implicit phrases, so that there were two experimental conditions, the case-marked one illustrated in (33) and the caseless one given in (34). We predicted lower ratings for the caseless condition.

(33) A: Chelswu-ka pat-ass-ney. B: Ung, sangkum-ul.
A: Chelswu-NOM receive-PST-DECL B: yes, prize-ACC
'(int.) Chelswu received (something).' B: 'Yes, a prize.'
Case-marked fragment

(34) A: Chelswu-ka pat-ass-ney. B: Ung, sangkum.
A: Chelswu-NOM receive-PST-DECL B: yes, prize
'*Chelswu received.' B: 'Yes, a prize.' Caseless fragment

As in Experiment 1, we used only structural case markers here.

5.1.1 *Method and procedure*

We created twelve sets of experimental items. Each antecedent (the A-sentence) was preceded by another sentence clarifying the context for it (see Appendix). The items were rotated across two stimulus lists in a Latin square design. The remaining

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procedures were the same as before. A total of 18 college students, all self-reported monolingual speakers of Korean, participated in the experiment in exchange for entry in a lottery.

5.1.2 *Results and discussion*

As before, we fitted an ordinal mixed effects model to the data. The model included Case (Caseless fragment, Case-marked fragment) as the only fixed effect and random intercepts and slopes for participants and items. Conditions were treatment-coded in accordance with our hypothesis. The raw means and standard deviation measures for all conditions are provided in Table 1. Consistent with the hypothesis, there was a main effect of Case such that caseless fragments were rated lower than case-marked ones ($\beta = -1.29, SE = 0.42, z = -3.05, p < 0.01$). This result supports the hypothesis that implicit correlates disfavor less explicit forms of fragments.

It is interesting to note in this regard that Korean case markers behave exactly like English prepositions in difficult-to-process environments of this kind. For instance, it is impossible to drop the preposition *about* from the fragment in (35), which has an implicit correlate (see Chung, Ladusaw & McCloskey 1995; Chung 2006, 2013), while there is no such restriction on fragments with overt correlates (see (36)).

(35) A: Harvey wants to talk.
B: *What?/About what?

(36) A: Harvey wants to talk about something.
B: What?/About what?

Because the retention of prepositions in English fragments can also be analyzed as producing more explicit forms (PPs) than dropping them (NPs) (see Nykiel & Hawkins 2020 for the details of this analysis), Korean and English fragments can receive a uniform explanation.

5.2 *Experiment 3: Caseless fragments are better with overt correlates than implicit ones*

Experiment 3 focuses on Korean semantic case markers. The difference between semantic and structural case is that the former may not be dropped from NPs in full clauses (see Kim 2016), making semantic case an appropriate testing ground for the hypothesis that less explicit (caseless) fragments would be rated better in easy-to-process environments, i.e. when the correlates are overt rather than covert.

Here we cross Correlate (Overt, Implicit) with Case (Caseless fragment, Case-marked fragment) in a 2×2 design, as in (37)–(40).[19]

[19] We observe with interest that three case markers (- *eykey/-hanthey/-lopwuthe*) are available to express the Source case in Korean (Kim 2016). If one of them is selected for an overt correlate, as

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(37) A: Phyenci-ka nwukwunka-lopwuthe wa-ss-e. B: Ung,
A: letter-NOM someone-from come-PST-DECL B: yes,
Mimi-lopwuthe.
Mimi-from
A: 'A letter came from someone.' B: 'Yes, from Mimi.'
Overt, Case-marked fragment

(38) A: Phyenci-ka nwukwunka-lopwuthe wa-ss-e. B: Ung, Mimi.
A: letter-NOM someone-from come-PST-DECL B: yes, Mimi
A: 'A letter came from someone.' B: 'Yes, Mimi.'
Overt, Caseless fragment

(39) A: Phyenci-ka wa-ss-e. B: Ung, Mimi-lopwuthe.
A: letter-NOM come-PST-DECL B: yes, Mimi-from
A: 'A letter came.' B: 'Yes, from Mimi.' Implicit, Case-marked fragment

(40) A: Phyenci-ka wa-ss-e. B: Ung, Mimi.
A: letter-NOM come-PST-DECL B: yes, Mimi
A: 'A letter came.' B: '*Yes, Mimi.' Implicit, Caseless fragment

5.2.1 *Method and procedure*

As before, we created twelve sets of experimental items. The items were rotated across four stimulus lists in a Latin square design. The stimulus lists were administered and acceptability ratings collected following the same procedures as before. A total of 27 college students, all self-reported monolingual speakers of Korean, participated in the experiment in exchange for entry in a lottery.

5.2.2 *Results and discussion*

Having followed the same procedures as before, we fitted an ordinal mixed effects model to the data, with Correlate and Case as fixed effects and random intercepts and slopes for participants and items. Conditions were given treatment coding in accordance with our hypotheses. The raw means and standard deviation measures for all conditions are provided in Table 1. We observed no main effects, although the ratings for caseless fragments trended in the direction of lower acceptability than case-marked fragments ($\beta = -1.29, SE = 0.84, z = -1.52, p = 0.12$), and so did ratings for items with implicit correlates compared to items with overt correlates ($\beta = -0.30, SE = 0.96, z = -0.32, p = 0.74$).[20] There was, however,

in (37)–(38), then the fragment must bear the same case marker (or be caseless). If the correlate is implicit, as in (39)–(40), then the fragment may bear any of the three case markers. We leave experimental verification of this observation for future research, but note here that these patterns are further evidence for the relevance of the argument structure options the correlate has and for the case-matching preference once a case-marker selection has been made by the overt correlate.

[20] It is surprising, as an anonymous referee points out, that we found no main effect of Correlate, although the ratings for implicit correlates trended in the expected direction. A penalty for implicit correlates has been documented for English sluicing (Frazier & Clifton 1998; Dickey &

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	Case	Mean	SE
Overt	Case-marked fragment	6	0.75
	Caseless fragment	4.2	0.65
Impl.	Case-marked fragment	5.6	0.84
	Caseless fragment	3.3	0.52

Table 3
Estimated marginal means and standard errors (confidence level 0.95) for Overt correlate and Implicit correlate conditions in Experiment 3.

a statistically significant interaction between Correlate and Case: caseless fragments were worse when their correlates were implicit than when they were overt ($\beta = -2.46,\ SE = 1.22, z = -2.01, p < 0.05$).

To explore this interaction further, we conducted pairwise comparisons with the *emmeans* package. We found that that the interaction was carried by the items with implicit correlates. That is, there was a penalty for caseless fragments compared to case-marked fragments that reached statistical significance for this set of items ($\beta = 3.76, SE = 0.92, z = 4.05, p < 0.001$), but none for the items with overt correlates ($\beta = 1.30, SE = 0.84, z = 1.52, p = 0.12$). Estimated marginal means for the overt-correlate and implicit-correlate conditions are given in Table 3.

This pattern of results closely tracks what we saw in Experiment 2, where caseless fragments were also more degraded than case-marked fragments when paired with implicit correlates. This indicates in turn that both semantic and structural case markers are aligned with respect to the acceptability of fragments in environments of varying processing difficulty.

6. General discussion

Our experimental results bear on the question of why case-matching effects arise under clausal ellipsis. We have argued that neither of the two types of syntactic analyses of these effects can adequately answer this question. First, the movement-and-deletion type is challenged by the mandatory case matching in Hungarian, and so is the direct interpretation analysis of Culicover & Jackendoff (2005). The Bulgarian, Icelandic, and Korean data are in turn problematic for Ginzburg & Sag (2000). Second, there are theory-internal problems caused by crosslinguistic evidence showing that the case features, including variation in case marking, assigned to correlates by some lexical heads in the antecedents are transferred onto fragments whether or not they have legitimate sentential sources. The movement-and-deletion type of analysis also faces the problem of how to reconcile the

Bunger 2011), English 'much less' ellipsis (Harris & Carlson 2019), and Polish sluicing (Nykiel & Kim 2022b). Although we have no explanation for why this wasn't the case in Korean, it's clear that there was a penalty for some participants: there was far more variation in the ratings for implicit correlates than in the ratings for overt correlates, as shown by the difference in standard deviation (see Table 1).

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availability of structurally nonidentical sentential sources for fragments with the assumption that fragments receive their case features from the same lexical heads as their correlates. And the direct interpretation type of analysis is not sufficiently sensitive to the argument structure of the lexical heads that assign case to fragments' correlates. Finally, neither type of analysis can explain the case-matching preference we demonstrated in Experiment 1. These analytical problems don't detract from the fact that case-matching effects follow straightforwardly from movement-and-deletion analyses whenever there is a legitimate sentential source for fragments, but they require additional stipulations on direct interpretation analyses.

The case-matching preference we have demonstrated could be seen as lying outside the purview of grammar. So long as we capture the range of cases licensed for each fragment, the patterns of preference seen in actual case marking could be considered performance preferences. However, we would like to argue against this view for two reasons. The preference for case matching that we confirmed in Korean (and also saw in Bulgarian and Icelandic) corresponds to a grammatical constraint in Hungarian, suggesting that what underlies this constraint in Hungarian is the preference to optimize the retrieval of a correlate for a fragment. Furthermore, we saw that case-matching effects arise even if the grammar has no means to license the case on a fragment locally (i.e. within an underlying clause that embeds the fragment), because no underlying clause is available. It appears that the grammar uses a nonlocal mechanism (recall the indirect licensing mechanism of Culicover & Jackendoff 2005) to license case on the fragment, and here is where the predictions of cue-based retrieval come in as a motivation for such a mechanism.

We have offered, and provided support for, a novel analysis of case-matching effects, which adequately captures not only the Korean data, but also the cross-linguistic data we have discussed in this paper. The ingredients of our analysis come from the cue-based theory of sentence processing, which takes the retrieval of the members of a nonlocal dependency to engage a direct-access mechanism that relies on the diagnosticity of the linguistic information encoded in the probe initiating the retrieval process. We have proposed that a fragment's case features are utilized as retrieval cues in the search for the correlate, and that matching case specifications on the fragment and the correlate are favored, especially if the grammar permits variation, as a way to optimize the retrieval mechanism. Experiment 1 has demonstrated that the pattern of acceptability judgments is consistent with this proposal. In Experiments 2–3 we have found further support for the assumptions of cue-based retrieval by demonstrating that speakers accept fragments with less specific retrieval cues in easy-to-process environments, that is, when the antecedent already supplies accessible information about the correlate. This analysis applies to instances of mismatching case features on the fragment and the correlate when the mismatch can be understood as a difference in the explicitness of the fragment. But it doesn't apply to actual differences in case, such as those seen in Bulgarian or Icelandic. In other words, we would not expect any acceptability difference between the case mismatch in (41) and in (42) in Icelandic, cited in Wood et al. (2020).

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(41) A: Mig vantar hníf. B: Mér lika.
A: me.ACC needs knife.ACC B: me.DAT too
A: 'I need a knife.' B: 'Me too.'

(42) A: Mér vantar hníf. B: Mig lika.
A: me.DAT needs knife.ACC B: me.ACC too
A: 'I need a knife.' B: 'Me too.'

The fragments *mig* 'me.ACC' and *mér* 'me.DAT' and their correlates represent separate cases (accusative vs dative) and therefore can't be argued to differ in explicitness.

The current results are the first step in the process of testing and further exploring the predictions of cue-based retrieval for clausal ellipsis. In particular, it remains to be seen if case mismatch not only lowers acceptability ratings but also elevates reading times during online comprehension of fragments and is disfavored in production, compared to case match. A separate strand of research could explore ways in which the grammar could interact with the cue-based theory of sentence processing. One way suggests itself already: if we accept that the grammar permits fragments and correlates to bear identical or nonidentical case features within the limits of the variation allowed for the correlates, then the case-matching preference (as in Korean, Bulgarian, and Icelandic) can be predicted as the pattern strongly favored by functional pressures acting on the parser during cue-based retrieval and mandatory case matching (as in Hungarian) can be predicted as conventionalization of that pattern as a grammatical constraint. Meanwhile, mandatory case matching elsewhere falls out straightforwardly from the lack of other case options available for the correlates. These ideas can be implemented as a motivation for case-matching effects on the direct interpretation approach to fragments, as it already assumes that the morphosyntactic features of a fragment are licensed nonlocally by the surrounding context. They could perhaps also be implemented on the movement-and-deletion approach as a means to explain away cases where case-matching effects arise in fragments without an apparent sentential source.

We leave it as an open question here why case marking on fragments is delimited by the argument structure of appropriate lexical heads. The possibility that a fragment may depart from the case currently marked on the correlate in favor of another case licensed for it suggests that the parser is guided by considerations of recoverability in the search for the target phrase initiated by the fragment. The parser's reliance on argument structure here may well be the consequence of how the full argument structure of lexical heads that have been encountered, including their optional arguments, is activated in online processing and hence accessible for retrieval. There is independent evidence that all dependents of a lexical head are simultaneously retrievable in online processing and the accessibility of each argument frame is impacted by its frequency of use (MacDonald, Pearlmutter & Seidenberg 1994a, b; Trueswell, Tanenhaus & Garnsey 1994). It is plausible that

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the parser and the grammar are aligned in this respect in order to aid in the interpretation of fragments.

7. Conclusion

This paper has presented experimental evidence in favor of a case-matching preference under Korean clausal ellipsis. This preference is observed when a fragment's correlate may receive more than kind of case marking from the licensing head and the fragment inherits the same options. We have argued that this preference does not lie outside the purview of grammar, is not predicted on any existing syntactic account of case-matching effects under clausal ellipsis, and its stronger variant – mandatory case matching in Hungarian – is problematic for some types of accounts. We have offered cue-based retrieval as an adequate analysis of case-matching effects in Korean and crosslinguistically, supporting our analysis with the results of three acceptability judgment studies.

Appendix

Experiment 1 items (the case-marking manipulations are enclosed in curly brackets)

1. A: Mimi-ka {mwues, mwues-ul} masy-ess-ni?
   A: Mimi-NOM {what, what-ACC} drink-PST-QUE?
   B: {Cwusu, Cwusu-lul}.
   B: {juice, juice-ACC}

2. A: Appa-ka Chelswu-eykey {mwues, mwues-ul} cwu-ess-ni?
   A: father-NOM Chelswu-DAT {what, what-ACC} give-PST-QUE
   B: {Yongton, Yongton-ul}.
   B: {allowance, allowance-ACC}

3. A: Mimi-ka {nwukwu, nwukwu-uy} sakwa-lul mek-ess-ni?
   A: Mimi-NOM {who, who-GEN} apple-ACC eat-PST-QUE?
   B: {Chelswu, Chelswu-uy}.
   B: {Chelswu, Chelswu-GEN}

4. A: Appa-ka Chelswu-eykey {nwukwu, nwukwu-uy} kong-ul
   A: father-NOM Chelswu-DAT {who, who-GEN} ball-ACC
   tency-ess-ni? B: {Mimi, Mimi-uy}.
   throw-PST-QUE? B: {Mimi, Mimi-GEN}

5. A: Chelswu-ka {mwues, mwues-ul} mek-ess-ni?
   A: Chelswu-NOM {what, what-ACC} eat-PST-QUE?
   B: {Sakwa, Sakwa-lul}.
   B: {apple, apple-ACC}

6. A: Chelswu-ka {nwukwu, nwukwu-lul} manna-ss-ni?
   A: Chelswu-NOM {who, who-ACC} meet-PST-QUE?
   B: {Mimi, Mimi-lul}.
   B: {Mimi, Mimi-ACC}

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7. A: Chelswu-ka {mwues, mwues-ul} hully-ess-ni?
   A: Chelswu-NOM {what, what-ACC} spill-PST-QUE?
   B: {Cwusu, Cwusu-lul}.
   B: {juice, juice-ACC}

8. A: Chelswu-ka {mwues, mwues-ul} kochy-ess-ni?
   A: Chelswu-NOM {what, what-ACC} fix-PST-QUE?
   B: {Aiphon, Aiphon-ul}.
   B: {IPhone, IPhone-ACC}

9. A: {nwukwu, nwukwu-uy} khi-ka ceyil khu-ni?
   A: {who, who-GEN} height-NOM most tall-QUE?
   B: {Chelswu, Chelswu-uy}.
   B: {Chelswu, Chelswu-GEN}

10. A: Chelswu-ka {nwukwu, nwukwu-uy} nothupwuk-ul
    A: Chelswu-NOM {who, who-GEN} laptop-ACC
    pilly-ess-ni? B: {Mimi, Mimi-uy}.
    borrow-PST-QUE? B: {Mimi, Mimi-GEN}

11. A: {nwukwu, nwukwu-uy} cip-i ceyil pwucani?
    A: {who, who-GEN} house-NOM most rich-QUE?
    B: {Chelswu, Chelswu-uy}
    B: {Chelswu, Chelswu-GEN}

12. A: Chelswu-ka {nwukwu, nwukwu-uy} kapang-ul hwumchy-ess-ni?
    A: Chelswu-NOM {who, who-GEN} bag-ACC steal-PST-QUE?
    B: {Mimi, Mimi-uy}.
    B: {Mimi, Mimi-GEN}

Experiment 2 items (the case-marking manipulations are enclosed in curly brackets)

1. A tray that was full of apples is empty now:
   A: Sakwa-lul ta mek-ess-ney. B: Ung, {Mimi, Mimi-ka}.
   A: apples-ACC all eat-PST-DECL. B: yes, {Mimi, Mimi-NOM}

2. A six-year Chelswu is buying snacks in the grocery store:
   A: Chelswu-eykey ton-ul cwu-ess-ney. B: Ung, {appa,
   A: Chelswu-DAT money-ACC give-PST-DECL. B: yes, {father,
   appa-ka}.
   father-NOM}

3. There was juice in the refrigerator, but it's gone now:
   A: Cwusu-lul ta masy-ess-ney.
   A: juice-ACC all drink-PST-DECL.
   B: Ung, {Mimi, Mimi-ka}.
   B: yes, {Mimi, Mimi-NOM}

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4. Chelswu and his father are playing catch-ball in the backyard:
   A: Chelswu-eykey kong-ul tency-ess-ney.
   A: Chelswu-DAT ball-ACC throw-PST-DECL.
   B: Ung, {appa, appa-ka}.
   B: yes, {father, father-NOM}

5. There's a picture of Chelswu holding a lottery ticket on Instagram:
   A: Chelswu-ka pat-ass-ney.
   A: Chelswu-NOM receive-PST-DECL.
   B: Ung, {sangkum, sangkum-ul}
   B: yes, {prize, prize-ACC}

6. There's a picture of Chelswu with Mimi on Instagram:
   A: Chelswu-ka manna-ss-ney.
   A: Chelswu-NOM meet-PST-DECL.
   B: Ung, {Mimi, Mimi-lul}.
   B: yes, {Mimi, Mimi-ACC}

7. Chelswu has a stain on his clothes:
   A: Chelswu-ka hully-ess-ney.
   A: Chelswu-NOM spill-PST-DECL.
   B: Ung, {cwusu, cwusu-lul}.
   B: yes, {juice, juice-ACC}

8. Chelswu's IPhone is working today although it didn't yesterday:
   A: Chelswu-ka kochy-ess-ney.
   A: Chelswu-NOM fix-PST-DECL.
   B: Ung, {aiphon, aiphon-ul}.
   B: yes, {IPhone, IPhone-ACC}

9. Chelswu, who is 2 meters tall, walks in:
   A: Khi-ka cengmal khu-ney.
   A: height-NOM really tall-DECL.
   B: Ung, {Chelswu, Chelswu-uy}.
   B: yes, {Chelswu, Chelswu-GEN}

10. Chelswu is using Mimi's laptop today:
    A: Chelswu-ka nothupwuk-ul pilly-ess-ney.
    A: Chelswu-NOM laptop-ACC borrow-PST-DECL.
    B: Ung, {Mimi, Mimi-uy}.
    B: yes, {Mimi, Mimi-GEN}

11. Chelswu's house looks luxurious:
    A: Cip-I cengmal pwuca-ney.
    A: house-NOM really rich-DECL.
    B: Ung, {Chelswu, Chelswu-uy}.
    B: yes, {Chelswu, Chelswu-GEN}

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12. A and B found Mimi's missing bag in Chelswu's locker.
A: Chelswu-ka kapang-ul hwumchy-ess-ney.
A: Chelswu-NOM bag-ACC steal-PST-DECL.
B: Ung, {Mimi, Mimi-uy}.
B: yes, {Mimi, Mimi-GEN}

Experiment 3 items (the case-marking manipulations are enclosed in curly brackets, and the explicitness/implicitness of parallel arguments is indicated by parenthesis)

1. A: Chelswu-ka kong-ul (nwukwu-eykey) tency-ess-ni?
A: Chelswu-NOM ball-ACC (who-DAT) throw-PST-QUE?
B: {Mimi, Mimi-eykey}.
B: {Mimi, Mimi-DAT}

2. A: Chelswu-ka phyenci-lul (nwukwu-eykey) ponay-ss-ni?
A: Chelswu-NOM mail-ACC (who-DAT) send-PST-QUE?
B: {Mimi, Mimi-eykey}.
B: {Mimi, Mimi-DAT}

3. A: Chelswu-ka (nwukwu-eykey) hwana-ss-ni?
A: Chelswu-NOM (who-DAT) angry-PST-QUE?
B: {Mimi, Mimi-eykey}
B: {Mimi, Mimi-DAT}

4. A: Chelswu-ka mikwuk-ey (nwukwu-wa) ka-ss-ni?
A: Chelswu-NOM U.S-to (who-with) go-PST-QUE?
B: {Mimi, Mimi-wa}.
B: {Mimi, Mimi-INSTR}

5. A: Chelswu-ka khonsethu-ey (nwukwu-wa) ka-ss-ni?
A: Chelswu-NOM concert-to (who-with) go-PST-QUE?
B: {Mimi, Mimi-wa}.
B: {Mimi, Mimi-INSTR}

6. A: Chelswu-ka (nwukwu-wa) ihon-hay-ss-ni?
A: Chelswu-NOM (who-with) divorce-do-PST-QUE?
B: {Mimi, Mimi-wa}.
B: {Mimi, Mimi-INSTR}

7. A: Chelswu-ka mwun-ul (mwues-ulo) pwusw-ess-ni?
A: Chelswu-NOM gate-ACC (what-with) break-PST-QUE?
B: {Mangchi, Mangchi-lo}.
B: {hammer, hammer-INSTR}

8. A: Chelswu-ka khemphyuthe-lul (mwues-ulo) kochy-ess-ni?
A: Chelswu-NOM computer-ACC (what-with) fix-PST-QUE?
B: {Pokkwussiti, Pokkwussiti-lo}.
B: {recovery-disc, recovery-disc-INSTR}

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9. A: Chelswu-ka son-ul (mwues-ulo) ssi-ess-ni?
   A: Chelswu-NOM hand-ACC (what-with) wash-PST-QUE?
   B: {Pinwu, Pinwu-lo}
   B: {soap, soap-INSTR}

10. A: Chelswu-ka senmwul-ul (nwukwu-lopwuthe) pat-ass-ni?
    A: Chelswu-NOM present-ACC (who-from) receive-PST-QUE?
    B: {Mimi, Mimi-lopwuthe}.
    B: {Mimi, Mimi-SRC}

11. A: Chelswu-ka chwuchense-lul (nwukwu-lopwuthe) pat-ass-ni?
    A: Chelswu-NOM reference-ACC (who-from) receive-PST-QUE?
    B: {Mimi, Mimi-lopwuthe}.
    B: {Mimi, Mimi-SRC}

12. A: Chelswu-ka somwun-ul (nwukwu-lopwuthe) tul-ess-ni?
    A: Chelswu-NOM rumor-ACC (who-from) hear-PST-QUE?
    B: {Mimi, Mimi-lopwuthe}.
    B: {Mimi, Mimi-SRC}

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