Causativity in zero and overt nominalizations: An experimental study

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ABSTRACT
We experimentally evaluate three patterns of deverbal nominalizations derived by means of zero, *-ing* and Romance suffixes (i.e., *-(at)ion*, *-ment*, and *-ance*) in English as to whether they can express causativity and anticausativity like their base verbs. We report the results of a first study which uses native speaker judgments to test the acceptability of these competing nominalizing suffixes (*-ing* vs. zero and *-ing* vs. Romance suffixes) in realizing event readings with argument structure inherited from their causative, and respectively, anticausative base verbs. While previous literature claims that zero cannot realize the structurally more complex causative readings, and *-ing* cannot realize anticausative readings, our current results indicate that all three suffixes may realize both types of readings. This is in line with data attested in natural text corpora and suggests that zero suffixes are not necessarily structurally simpler than overt suffixes as often claimed in previous literature.

KEYWORDS
Anticausativity, causativity, *-ing* suffix, nominalization, Romance suffixes, zero suffix

DOI
https://doi.org/10.14712/18059635.2025.1.3

1 INTRODUCTION

Deverbal nominalization in English involves at least three morphological patterns, which may compete for the same verbal base, as illustrated in (1).

(1a) to divide (verb)
(1b) the divis-ion (ATK-N)
(1c) the divid-ing (ING-N)
(1d) the divide-Ø (Zero-N)

From the verb *to divide* we may derive *division* with a Romance suffix, which we will refer to as an ATK-N(ominal) (from '-ATion and Kin', Borer, 2013), *dividing* involves the suffix *-ing* (ING-N), and *divide* is derived by means of zero (Zero-N). Among these suffixes, *-ing* is known as the most productive one, attaching to any verb except for states (Asher, 1993; Borer, 2013; Iordăchioaia & Werner, 2019), while ATK-suffixes and zero are selectionally more restricted. For this reason, not many verbs show all three patterns as in (1), and in this paper we therefore focus on competing pairs such as *-ing* vs. zero, *ing* vs. ATK, and, indirectly, also zero vs. ATK.

The analysis of zero forms such as in (1d) is controversial: some authors speak of derivation by means of a zero suffix (Marchand, 1969; Kiparsky, 1982; Don, 1993, 2005;

Alexiadou & Grimshaw, 2008; Iordăchioaia & Melloni, 2023a), others argue against a zero suffix and refer to this process as conversion, category underspecification and the like (Lieber, 1981, 2016; Farrell, 2001; Plag, 2003; Borer, 2013). Although we do not directly address this debate (but see Bauer & Valera, 2005; Dahl & Fábregas, 2018; Iordăchioaia & Melloni, 2023b for critical overviews), our guiding hypothesis follows the zero-derivation approach, as we aim to directly compare zero with overt suffixes and hypothesize that there is no structural difference between them.

We propose an acceptability judgment task, in which we test the ability of Zero-Ns to realize structurally complex readings of their base verbs in comparison with overtly derived ATK-Ns and ING-Ns. There are two questions related to this issue. The first is whether Zero-Ns may inherit argument structure from their base verbs like ATK-Ns and ING-Ns usually do, forming event nominals (see Grimshaw, 1990; Borer, 2013; Lieber, 2016). The second question is whether such zero event nominals with argument structure may express causative events or are limited to anticausative events. Causative events are structurally more complex than anticausative ones (Alexiadou et al., 2015) and implicitly more difficult to be hosted by zero morphology in Zero-Ns, according to previous literature such as Grimshaw (1990), Marantz (1997), Borer (2013) and others.

Our project consists of two parts, investigating different aspects of the acceptability of the data. First, in an acceptability judgment study we test the acceptability of pairs of nominalizations built on anticausative and causative verbs in eventive contexts with verbal argument structure realization, and second, in a forced choice interpretation study we aim to check the compatibility of such previously tested nominalizations with contexts that impose causative vs. anticausative readings of alternating verbs such as *to crash* in (2) below. In this paper we present the first part, namely the acceptability judgment study, and draw conclusions on the basis of these intermediate results, which provide preliminary support for our guiding hypothesis.

We start by introducing the empirical issue and the previous claims in the literature on causative/anticausative readings in nominalizations in Section 2. In Section 3 we present our experimental design and in Section 4 we summarize our results and interpret them within the background of the claims and predictions in the previous literature. Section 5 concludes on these findings and proposes a follow-up to compensate for some shortcomings of the current study.

2 THEORETICAL BACKGROUND

2.1 (ANTI)CAUSATIVITY IN THE VERBAL DOMAIN

The causative alternation, one of the most studied topics in lexical semantics, refers to the ability of some verbs such as *to crash* to exhibit both a transitive causative reading as in (2a) and an intransitive anticausative (essentially, unaccusative) reading as in (2b). Unlike other languages, English does not mark this alternation on either of the two forms:

(2a) The hijackers crashed the plane. (causative reading)
(2b) The plane crashed. (anticausative reading)

The causative reading realizes both an external (*the hijackers*) and an internal argument (*the plane*) and behaves like causative-only verbs such as *to destroy* — and unlike unaccusative/anticausative-only verbs such as *to disappear* — in building passives with an optional *by*-phrase, as in (3a). The anticausative reading in (3b) behaves like typical unaccusative verbs: it realizes the internal argument of the causative verb as a subject and cannot license external arguments in a *by*-phrase (Rappaport Hovav & Levin, 1998; Schäfer, 2009; Alexiadou et al., 2015). Following this literature, we consider the causative variant of an alternating verb to pattern with causative-only verbs and the anticausative variant with non-alternating unaccusative verbs.

(3a) The plane was crashed/destroyed/*disappeared (by the hijackers).
(3b) The plane crashed/*destroyed/disappeared (*by the hijackers).

Since the early studies in lexical semantics, the causative variant has been argued to be structurally more complex than the anticausative one independent of the type of (semantic or syntactic) theory adopted (see Dowty, 1979; Rappaport Hovav & Levin, 1998; Ramchand, 2008; Alexiadou et al., 2015; Beavers & Koontz Garboden, 2020 and references therein). In Dowty (1979), Rappaport Hovav & Levin (1998 and later work), and Beavers & Koontz-Garboden (2020), the causative variant involves a CAUSE operator on top of the content of the anticausative one, while in Ramchand (2008) and in Alexiadou et al. (2015), the causative form involves additional syntactic structure.

2.2 DEVERBAL NOMINALIZATIONS

The causative alternation itself has not been thoroughly investigated in the domain of deverbal nominalizations. Related claims have been made within the larger discussion on how nominalizations may resemble their base verbs and how much they may preserve from the verbal event structure, especially building on Grimshaw (1990).

The main observation that Grimshaw (1990) makes is that (overtly suffixed) deverbal nominalizations may realize what came to be later known as *argument structure nominals* (ArgStr-Ns; in Grimshaw's terms *complex event nominals*), which inherit the full argument and event structure of their base verbs, as in (4a), in contrast with *result nominals* (Res-Ns), which have lost any connection to the verb's event structure and behave like lexical nouns, as in (4b). While the ArgStr-N *examination of the patients* in (4a) requires a predicate of events such as *took a long time* and is incompatible with a predicate of individuals such as *was on the table*, the Res-N *examination* in (4b) behaves like the clipped lexical noun *exam* in this respect.

(4a) *The examination*/*exam *of the patients* took a long time/*was on the table.
(4b) *The examination*/exam was on the table.

Grimshaw's claim is that ATK-Ns like *examination* are systematically ambiguous between the two readings, as in (4), while ING-Ns always form ArgStr-Ns.[1] She further claims that Zero-Ns never form ArgStr-Ns due to their zero morphology. She consequently argues for a split between overtly marked nominalizations, which may form ArgStr-Ns, and Zero-Ns, which never do.

Borer (2013) further investigates this issue and strengthens Grimshaw's original claims by contrasting Zero-Ns with either ATK-Ns or ING-Ns built on the same verb, as in (5). In these examples it is clear that the Zero-Ns do not form ArgStr-Ns, and only the overtly suffixed ATK and ING nominals do.

(5a) the importation/*import of goods from China in order to bypass ecological regulations
(5b) the walking/*walk of the dog for three hours

Following such contrasts, Borer argues that Zero-Ns cannot accommodate any compositional event structure from their base verbs and they are idiosyncratic like lexical nouns. She uses these observations in support of a broader thesis against derivational zero morphology, given that, as she claims, it cannot encode a complex syntax-semantics mapping, as required by ArgStr-Ns.

However, more recent developments in the study of Zero-Ns have argued that these can form ArgStr-Ns as well, even if they are admittedly more idiosyncratic in that some do not primarily express events (Newmeyer, 2009; Lieber, 2016; Iordăchioaia, 2020; Iordăchioaia et al., 2020; Iordăchioaia & Melloni, 2023a). For instance, while Iordăchioaia et al. (2020) present Zero-Ns such as *cut*, *crack*, and *bruise*, which are less likely to form ArgStr-Ns, Iordăchioaia & Melloni (2023a) offer examples of ArgStr-Ns as in (6), taken from the *Corpus of Contemporary American English*:

(6a) a continuation of *the drain of capital* from the developing world
(6b) *our surrender of freedom and property* under coercion and threat
(6c) *the spread of disease by travelers*

These new insights suggest that at least some Zero-Ns behave similarly to ING- and ATK-Ns in their ability to inherit the event and argument structure of their base verbs in the shape of ArgStr-N readings.

2.3 (ANTI)CAUSATIVITY IN NOMINALIZATIONS

Within the debate on the possible structural complexity of deverbal nominalizations and the general observation that causative readings are more complex than anticausatives, the literature has made several observations that are instrumental to our study. In particular, various claims lead to the expectation that ATK-Ns should be compatible with *both* causative and anticausative readings; that ING-Ns should allow

1 The latter part cannot hold, given ING-Ns such as *building*, *painting* and the like, which also have Res-Ns readings, but it is generally acknowledged that ING-Ns — like ATK-Ns — can always realize ArgStr-Ns, even if they may also allow Res-N readings (see Lieber, 2016).

causative readings but disallow anticausative ones; and that Zero-Ns should only allow anticausative readings, to the extent that they can be eventive at all. Below we summarize these claims.

First, ATK-Ns built from causative alternating verbs as in (7c) have been shown to be ambiguous between a causative and an anticausative reading, basically encoding both readings of their alternating base verbs in (7a) and (7b). Adding a *by*-phrase disambiguates the nominals for a (passive) causative reading in (7c) (see Harley & Noyer, 2000; Alexiadou et al., 2009; Sichel, 2010; Alexiadou et al., 2013). ATK-Ns built from causative-only verbs, such as in (7d), convey only causative meanings, while ATK-Ns built from anticausative/unaccusative-only verbs, as in (7e), derive only anticausative readings, as expected:

(7a)	John accumulated wealth.	(causative)
(7b)	Wealth accumulated (*by John).	(anticausative)
(7c)	the accumulation of wealth (by John)	(causative/anticausative)
(7d)	the destruction of the vase (by John)	(causative-only)
(7e)	the disappearance of the plane (*by the hijackers)	(anticausative-only)

Second, a contrast has been observed between ATK-Ns and ING-Ns to the extent that the latter exclude a self-action interpretation in examples such as (8). While in (8a) the agent of the registration event may be identical to the theme *the children*, (8b) requires an agent different from the theme *the children* (Kratzer, 2003; Alexiadou et al., 2009).

(8a)	The registration of the children (was slow).	(Ag≠Th; Ag=Th)
(8b)	The registering of the children (was slow).	(Ag≠Th; *Ag=Th)

Following Kratzer's (1996) hypothesis that a Voice projection hosts the external argument of causative active and passive verbs, which in her analysis accounts for the disjoint effect between external and internal arguments, the restriction in (8b) indicates that ING-Ns must project Voice.[2] Implicitly, this suggests that anticausative/unaccusative readings (which lack Voice and external arguments) should not be possible with ING-Ns (Alexiadou et al., 2009, 2013; Iordăchioaia, 2008).

Borer (2013, ch. 4) further substantiates the empirical contrast between ATK-Ns and ING-Ns (though in a different formal account) and argues that ING-Ns express only causative/transitive events and are excluded with unaccusative (and, implicitly, anticausative) verbs. She offers examples of ING- and ATK-N pairs such as in (9), for which she takes the ING-N to be completely ungrammatical. Iordăchioaia & Werner

2 Kratzer (1996) discusses the contrast between eventive and adjectival passives as in (i) below. The eventive passive in (ia) projects Voice and requires an agent disjoint from the theme, while the adjectival passive in (ib) allows also a reading in which the children have registered themselves, which indicates that Voice is not present in its structure:

(i) a. The children are being registered (by somebody/*themselves). (Ag≠Th; *Ag=Th)
b. The children are registered. (Ag≠Th; Ag=Th)

(2019), however, argue that ING-Ns are only slightly less acceptable than the ATK-Ns, due to the latter being more entrenched with Latinate verbs.[3, 4]

(9a) the arrival/?arriving of the train
(9b) the disappearance/?disappearing of the rabbit

Although the differences between ATK-Ns and ING-Ns with regard to (anti)causativity may not be as strong as claimed by Borer, there is a general agreement in the literature that ING-Ns highlight the process part of a causative event to the exclusion of the result state, while ATK-Ns express both. The presence of an external argument and causativity are thus more prominent in ING-Ns than in ATK-Ns. But the question is whether this sensitivity can really be formulated as a restriction of ING-Ns to causative verbs.

Third, Zero-Ns have only been touched upon in this discussion, but the few remarks predict a contrast in the opposite direction from ING-Ns: namely, they are expected to appear with anticausative but not with causative verbs. Smith (1972) contrasts Zero-Ns with ATK-Ns and argues that they are restricted to intransitive (unergative or unaccusative) readings. Cetnarowska (1993), meanwhile, compares zero with *-ing* and highlights the unergative reading of the Zero-N vs. the causative reading of the ING-N in examples such as (10):

(10a) the *beat* of the heart
(10b) the *beating* of prisoners

Although (10) does not contrast a causative with an anticausative reading, the difference is reminiscent of the structural contrast between the two types of verbs: while causative verbs have (complex) bi-eventive structures, unergative verbs (like anticausatives) are simpler, as they have mono-eventive structures. Marantz (1997) addresses the same contrast from the causative/anticausative perspective and argues with data as in (11) that Zero-Ns realize only anticausative and not causative readings, in contrast with ING-Ns:

(11a) The elevator's *rise* to the top floor
(11b) John's *raising/*raise* of the glass

2.4 THE CHALLENGE

The observations above show interesting differences between the three types of nominalizations, which have found some theoretical explanation in terms of the structural complexity that the different nominalizing suffixes may encode. These observations can be summarized in three points as in (12).

3 The judgments in (9) are taken from Iordăchioaia & Werner (2019).

4 A further intervening factor that may be responsible for the slightly reduced acceptability of the ING-N in (9) is the preference of *-ing* for atelic events, as argued in Borer (2013, ch. 4), even though it is not entirely excluded with telic ones, as also indicated in Alexiadou et al. (2010, p. 552–553). In our study discussed in Section 4, most nominalizations

(12) Previous generalizations on (anti)causative events in nominalizations:
(12a) ATK-Ns allow both causative and anticausative readings.
(12b) ING-Ns allow causative readings but disallow anticausative readings.
(12c) Zero-Ns allow anticausative readings but disallow causative readings.

The generalizations in (12) create a coherent picture about how the three nominalizing patterns might compete and complement each other, which would be worth testing experimentally in its own right. There is, however, one more reason to test them, namely, the fact that these contrasts have been challenged by empirical counterevidence. For instance, Lieber (2016, p. 47–49) provides corpus examples with all three nominalization patterns built on unergative, unaccusative, as well as alternating (anti)causative verbs. (13) lists excerpts from Lieber's examples, which challenge the generalizations in (12b) and (12c): (13a) and (13b) show ING-Ns with an unaccusative verb and an anticausative reading of an alternating verb (cf. (9b)), while (13c) presents a Zero-N with the causative reading of an alternating verb.

(13a) you are defining the Resurrection as *the disappearing of the body*
(13b) that portion is the joy that feeds *the growing of another life* within you
(13c) the officer was improper on *his stop of this car*

In particular, we also find various counterexamples to the generalization in (12c), which is central to our discussion. (14a) (from the *Corpus of Contemporary American English*) challenges the claim about (11b), and (14b) is a further example of a causative Zero-N (from the corpus *News on the Web*); see also the examples in (6):

(14a) a continuous raise of salaries
(14b) the deliberate crash of a passenger jet

3 ACCEPTABILITY JUDGMENT STUDY

Given the controversial picture of the behavior of the three types of deverbal nominalizations with respect to causative and anticausative/unaccusative verbs, we aim to experimentally test the generalizations in (12). As mentioned in Section 1, in this project we plan to investigate different aspects of the acceptability of the data by means of at least two studies. In a first step we test the acceptability of pairs of nominalizations built on anticausative/unaccusative and causative verbs using native speaker judgments, and in a second step we will have a forced choice interpretation study to check the compatibility of these nominalizations with contexts that impose causative vs. anticausative readings on alternating verbs. In this paper we present the results of the judgment study.

encoded atelic events, and for the few telic ones, ING-Ns did not appear to be less acceptable. If inner aspect played any role, it was negligible for the final results.

3.1 RESEARCH QUESTION AND GUIDING HYPOTHESIS

The overarching goal of our research is to find out whether the zero nominalizing suffix is indeed more restricted in accommodating the meanings and structures of their base verbs compared to overt suffixes, as often claimed in the literature (see Grimshaw, 1990 and Borer, 2013 as representative for the zero nominalizing suffix in English). In this project we focus on causative vs. anticausative/unaccusative verbs against the background that causative verbs are structurally more complex than the anticausative/unaccusative ones.

Following several studies on Zero-Ns in English and other languages, which challenge the claims about the inability of zero to host complex syntax-semantics (see Meinschäfer, 2005; Newmeyer, 2009; Fábregas, 2014; Lieber, 2016; Iordăchioaia et al., 2020; Iordăchioaia, 2020; Iordăchioaia & Melloni, 2023a), our guiding hypothesis is that Zero-Ns can express both causative and anticausative/unaccusative readings, i.e., zero morphology is not restricted to simple structures. In this respect, we expect Zero-Ns to behave like ATK-Ns. This means that we aim to test (and challenge) the generalization in (12c).

Ideally, to this aim we should test Zero- and ATK-Ns built on the same verbs, and leave ING-Ns out. However, zero and ATK have strong selectional restrictions with respect to their bases and often find themselves in complementary distribution: cf. *increase* vs. outdated *increasement*, or archaic *amaze*, meanwhile replaced by *amazement*. This makes it difficult to find well-balanced pairs of such nouns. Moreover, *-ing* is the most productive nominalizing suffix in English, which means that an ING-N would also be in principle available for every verb with both Zero and ATK nouns, which could influence the speakers' intuitions about their relative acceptability. For these reasons, we are testing verbs with ING- and Zero-Ns as well as verbs with ING- and ATK-Ns, thus aiming at a comparison of Zero-Ns and ATK-Ns mediated by ING-Ns.

3.2 STIMULI AND DESIGN

The study included three types of base verbs: causative-only verbs (CAUS), anticausative/unnaccusative-only verbs (ANTI), and verbs which alternate between these two interpretations (ALT). Verbs were collected from VerbNet (https://verbs.colorado.edu/verbnet/, Kipper-Schuler, 2006), a database of English verbs organized into lexical semantic classes based on Levin (1993). A total of 24 verbs were chosen for the study: 8 CAUS, 8 ANTI, and 8 ALT. Each of these verbs formed pairs of nominals suffixed with either ATK and ING (4 verbs for each Verb Type) or Zero and ING (4 verbs for each Verb Type), for a total of 48 separate nominalizations.

Nominalizations derived from ALT verbs were included in this task so as to provide baseline acceptability ratings in eventive sentences, for use in our later investigations with explicitly causative and anticausative contexts (see Section 5). However, as these verbs are in principle ambiguous between causative and anticausative readings in the absence of a context, their nominals may be as well, and it will therefore not be clear which reading is being judged in an isolated sentence. In what follows we thus limit our focus to the CAUS and ANTI verbs, as the only eventive reading their nominals should have is that of the base verb.

The total number of verbs eligible for inclusion was relatively limited for a number of reasons:

i. Although productive, ING-Ns may be quite infrequent, and not all corpora disambiguate them from other uses of *-ing* (e.g., the participle, the adjective, etc.). Verbs were therefore required to have their respective ING-N separately attested in the online *Oxford English Dictionary* (*OED*, www.oed.com) and assigned to frequency band 2 or higher (at least ~0,009 occurrences per million words).
ii. The Zero-Ns had to be attested with event readings and argument structure, rather than solely result readings (based on their OED definitions and attestations in corpora such as COCA, NOW or GloWbE in Davies 2008-, 2013, 2016-; see the dataset in Iordăchioaia & Melloni, 2022).
iii. ATK-Ns could not involve affixation onto suffixed bases (e.g., *equal+iz+ation*), as comparable cases of Zero affixation do not occur; similarly, we also did not include Zero-Ns derived from particle verbs (e.g., *bail+out*), as such verbs do not form nominals with ATK suffixes.

Focusing only on the CAUS and ANTI verbs, there were therefore 32 nominalizations across 8 conditions, based on Verb Type (CAUS vs. ANTI), Pair Type (pairs with ATK-Ns vs. Zero-Ns) and Suffix (ING vs. Other). Base verbs were matched in frequency across the two Pair Types (ATK: 43,78 per million; Zero: 53,07; $F_{1,30}$ = 0,151, p = 0,70).[5] These 32 nominalizations are presented in Table 1 below. Mean frequencies of the verbs and nominalizations in each condition can be found in the Appendix.

Verb Type	ATK Verbs		Zero Verbs	
	ATK	**ING**	**Zero**	**ING**
CAUS	correction nourishment reduction suppression	correcting nourishing reducing suppressing	massacre upload murder raise	massacring uploading murdering raising
ANTI	emergence disappearance expiration putrefaction	emerging disappearing expiring putrefying	rise decay fall plunge	rising decaying falling plunging

TABLE 1. List of items organized by Verb Type (CAUS, ANTI), Pair Type (ATK, Zero) and Suffix (ATK vs. ING, Zero vs. ING)

5 We also attempted to balance the various groups based on a number of other factors, but were unable to do so due to the limited numbers of possible verbs and their distributional behavior. For example, as noted above, the ING-Ns are consistently much less frequent than their ATK-N or Zero-N partners. Additional factors include etymological origin (where ATK verbs are largely of Romance origin, and Zero verbs more balanced between Romance and Germanic), and morphological complexity of the base (where ATK verbs are largely complex, involving bound Latinate morphemes, while Zero verbs are largely simple). We attempt to account for these issues in our analysis and interpretation (see Section 4).

For each nominalization, we created a sentence using one of four event-denoting predicates in the simple past tense: *took place, happened, occurred,* and *witnessed,* which should force an eventive reading of the nominal (Vendler, 1968; Dowty, 1979; Grimshaw, 1990). The two sentences for a given verb were identical apart from the nominals under investigation, and each predicate appeared only once within each of the 8 conditions. (15) illustrates the Zero-ING pair built on the anticausative/unaccusative verb *to rise*:

(15a) ZERO sentence: *The rise of the water levels* **happened** in the summer of 2022.
(15b) ING sentence: *The rising of the water levels* **happened** in the summer of 2022.

The 48 nominalization sentences (32 CAUS+ANTI, plus 16 ALT) were divided and distributed over 2 experimental lists (24 items per list), such that each list contained 2 items from every condition, and every verb appeared once and only once in each list. Competing nominalizations from the same verb appeared in different lists, so that no participant saw more than one of a verb's nominalizations.

To each list we added 48 filler sentences: 24 *wh*-islands and 24 progressives. We specifically selected fillers which covered a range of acceptability (including intermediate values), as we expected that the nominalizations might not be rated highly due to their complexity and relatively low frequency. The *wh*-island fillers followed observations and data from Sprouse et al. (2016), who identified three levels of acceptability with *wh*-extractions, depending on their level of embedding, as illustrated in (16).

(16) *Wh*-island fillers (see Sprouse et al., 2016)
(16a) Good: *Who*__ heard that my brother baked the pie?
(16b) Medium/Middle: *What* did you mention [that your cousin ate __]?
(16c) Bad: *What* did you deny [the fact [that Susan cooked __]]?

The progressive fillers were somewhat more complex, as sentences which should in principle be unacceptable (e.g., (17b) below) are often controversial, and may be coerced into more intermediate acceptability (Grafmiller, 2013). We therefore created 12 "good" sentences and 12 "bad" ones, with the latter containing a wide range of controversial progressives built on psych and stative verbs. While these may elicit a relatively wide range of acceptability, they should, on the whole, be relatively worse than progressives of straightforward eventive verbs. Examples are given in (17):

(17) Progressive fillers
(17a) Good: Jane *is walking to her office* down the road.
(17b) Bad: Henry *is knowing the truth* about his origins.
The girl *is having beautiful blue eyes*.
The children *are liking their new presents*.
The mountain view *is amazing Sam*.

3.3 PARTICIPANTS AND PROCEDURE

The two lists of 72 sentences each were presented in Gorilla Questionnaire Builder (www.gorilla.scwww.gorilla.sc, Anwyl-Irvine et al., 2020). Data was collected between 8 and 19 June, 2024. Fifty-three monolingual speakers of American English between the ages of 20 and 71 (Mean: 38,2) were recruited via Prolific (www.prolific.com) and compensated 3,5 GBP for their time. Participants were assigned to one of the two lists (27 in List 1, 26 in List 2), and instructed to rate each of the 72 sentences according to how acceptable they would sound when said by a native speaker of English. After 3 fillers, sentences were presented in a different random order for each participant. Ratings were given on a discrete scale from 1 to 7, with 7 being fully acceptable. To ensure that participants were not responding randomly, we also added 6 attention checks in line with Prolific's guidelines for nonsensical items; these items were distributed throughout the questionnaire. Mean completion time was approximately 9,87 minutes.

4 RESULTS AND INTERPRETATION

Raw ratings were z-score normalized by participant; more positive numbers indicate higher acceptability. As the good and bad *wh*-island fillers provided the strongest acceptability distinction, participants who responded inaccurately to these were excluded from the analysis; 5 participants had 3 or more responses (out of 16) to these items which were more than 2 standard deviations from the mean across participants, and their data was therefore excluded (Huang et al., in press).

The 48 remaining participants thus each provided two judgments for each of the 8 Pair Type x Verb Type x Suffix conditions in our study, resulting in 96 judgments per condition. Following Sprouse and Almeida (2017) and Marty et al. (2020), around only 40–43 judgments per condition should, in principle, be sufficient to reach 80% statistical power in an acceptability task, for medium effect sizes. However, given the small number of verbs tested here, and the potential subtlety of the effect we are testing, the results below should be interpreted cautiously, in case the analysis is underpowered (see Section 5 for further discussion).

4.1 MEAN RATINGS

Figure 1 presents the distribution of z-score ratings for the filler sentences, and Table 2 gives their mean ratings and standard deviations.

Filler type	Mean	SD
ISL-BAD	–1,56	0,50
ISL-GOOD	0,38	0,63
ISL-MID	–0,21	0,79
PROG-BAD	–0,41	1,05
PROG-GOOD	0,89	0,42

TABLE 2. Means for fillers

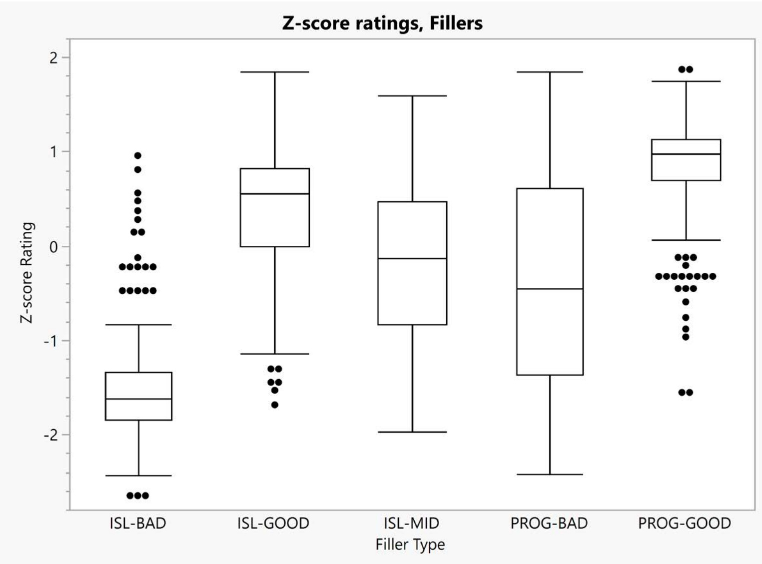

FIGURE 1. Z-score ratings for fillers

The fillers occupy a relatively wide range of acceptability, and present nothing surprising. The clearest distinction is between the good (ISL-GOOD) and bad *wh*-islands (ISL-BAD), with the latter rated the least acceptable. The islands of medium acceptability (ISL-MID) fall somewhere between. Among the progressive sentences, the eventive "good" progressives (PROG-GOOD) were the most acceptable of all the fillers, with more apparent agreement across participants. In contrast, the controversial progressives (PROG-BAD), while less acceptable on average, show a wide range of ratings — a not entirely unexpected result, given the ability of some psych and stative verbs to be coerced into a more acceptable interpretation in progressive contexts (see Grafmiller, 2013).

In Figure 2 we present a general picture of the ratings for our main items under investigation: the nominalization sentences. The ratings below are grouped by Pair Type (nominalizations derived from ATK verbs vs. Zero verbs), and by Suffixes (ING vs. Other). Thus, for the ATK verbs, the "Other" suffix is ATK (e.g., *correction*), while for the Zero verbs, "Other" represents Zero (e.g., *massacre*). CAUS and ANTI verbs are treated together here.

Nominalization	Mean	SD
ATK verbs, ING	−0,06	0,75
ATK verbs, ATK	0,26	0,68
Zero verbs, ING	0,22	0,73
Zero verbs, Zero	0,42	0,75

TABLE 3. Means for nominalizations

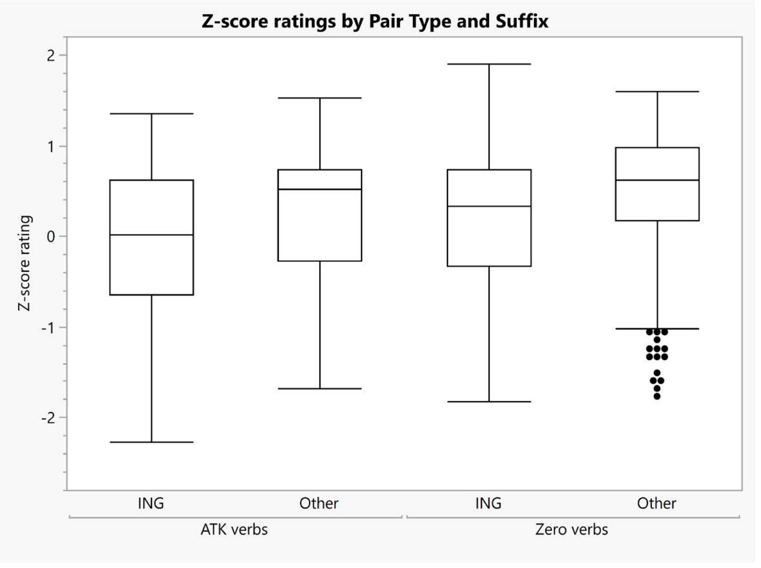

FIGURE 2. Z-score ratings for nominalizations

If we compare these ratings with those of the fillers above, we find that while none of the nominalization sentences were quite as acceptable as the best fillers (PROG-GOOD, mean: 0,89), they were nevertheless better overall than the worst fillers (ISL-BAD, mean: -1,56), as well as numerically better than the middle fillers (ISL-MID, mean: 0,21). In general, they seem to fall approximately in the middle of the scale, though there is of course some variation.

4.2 LINEAR MIXED EFFECTS ANALYSIS

In order to further investigate the differences between the different types of nominalizations, we ran a linear mixed effects model in R (version 4.4.1), using the *lme4* package (Bates, M. et al., 2015). Fixed effects were Pair Type (ATK verbs vs. Zero verbs), Verb Type (ANTI vs. CAUS), and Suffix (ING vs. Other), as well as all their interactions. Contrasts were treatment coded with ATK verbs, ANTI, and ING as the reference levels. Random effects included only intercepts for participants and items; models including random slopes were either singular or failed to converge. Frequency covariates of base verb frequency and nominal frequency were investigated; however, neither significantly improved model fit (as assessed via likelihood ratio test), and they were thus not included in the final model (Bates, D. et al., 2015).[6]

The analysis revealed no significant effects, thus suggesting that all 8 conditions behaved relatively similarly. Least-squares means for each of these conditions were

6 This suggests that neither verbal nor nominal frequency played a significant role in determining acceptability; however, see section 4.3 below.

computed using the *emmeans* package (Lenth, 2024); these are reported below in Section 4.3 and in the Appendix.

In view of the systematic differences between ATK verbs and Zero verbs in terms of both etymological origin and morphological complexity, we also ran two additional models which investigated these effects separately, using either origin (Romance vs. Germanic) or complexity (simple vs. complex) as a fixed effect, with random intercepts for participants and items. Neither were found to be significant predictors of relative acceptability.

4.3 TESTING PREVIOUS PREDICTIONS ON (ANTI)CAUSATIVITY WITH DIFFERENT SUFFIXES

Let us consider the results in view of the predictions in (12), according to which ATK-Ns should allow both causative and anticausative readings, ING-Ns should allow only causative readings, and Zero-Ns should be possible only with anticausative readings. Tables 4 and 5 give the least-squares means and standard errors (SEs) from each condition, as output by the mixed effects model. Figure 3 presents the fitted values from the model for ATK-Ns and Zero-Ns, while Figure 4 presents the values for the corresponding ING-Ns (paired with either ATK- or Zero-N verbs).

As mentioned just above, the linear mixed effects analysis revealed no significant differences between any of the conditions included in our study. At least for ATK-Ns, this result is fully compatible with prediction (12a) from previous literature, according to which ATK-Ns should be similarly available with both causative and anticausative readings, as visible in Figure 3 and Table 4.

Nominalization	Mean	SE
ATK, ANTI	0,276	0,165
ATK, CAUS	0,253	0,165
ZERO, ANTI	0,557	0,165
ZERO, CAUS	0,289	0,165

TABLE 4. Means for ATK-/Zero-Ns

For Zero-Ns, prediction (12c) says that they should be only acceptable with anticausative verbs. Although the ratings for anticausative Zero-Ns are indeed numerically higher than those for causative Zero-Ns, as seen both in Figure 3 and Table 4, this difference is not significant either, and their distributions in these conditions clearly overlap. Moreover, the ratings for causative Zero-Ns are quite similar to those for ATK-Ns, which means that they cannot be considered to be anywhere close to unacceptability (cf. bad fillers in Figure 1). This pattern is also unlikely to be a result of particularly frequent Zero-Ns compensating for lower acceptability, as the items in the Zero CAUS group are less frequent than those of ATK (both the base verb and the nominalization; see Appendix). These results speak against prediction (12c) and in favor of our hypothesis that Zero-Ns should be possible with both anticausative and causative verbs and, implicitly, comparable to ATK-Ns in this respect.

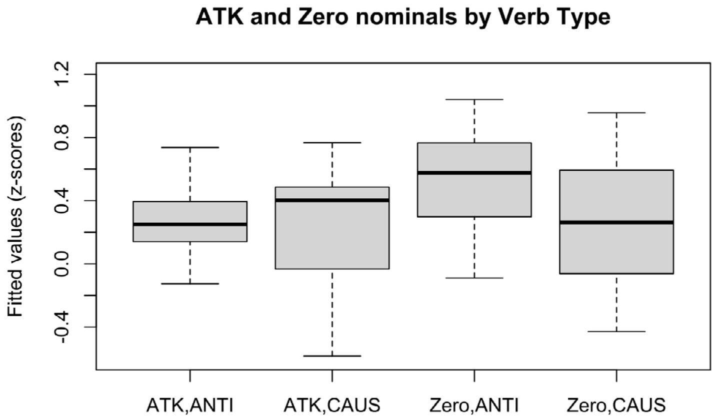

FIGURE 3. Fitted values for ATK-Ns and Zero-Ns by Verb Type

The results for ING-Ns are given in Figure 4 and Table 5 (separated according to which suffix they were paired with [ATK or Zero], as well as the Verb Type [ANTI or CAUS]). A first observation here is that, in general, ING-Ns that find themselves in competition with ATK-Ns (i.e., labelled under Pair Type ATK verbs) are numerically slightly worse than those in competition with Zero-Ns (even though the difference is not statistically significant). This is potentially due to several factors mentioned in Section 2.3 that concur towards favoring ATK-Ns in these pairs. Furthermore, given the selectional restrictions of the ATK suffixes, all chosen base verbs are of Latin origin, and the ATK-N is thus the default nominalization for such verbs, *-ing* being a Germanic suffix. In line with this, the ATK-N is usually much more frequent than the ING-N in a pair (22,75 vs. 0,05 for CAUS verbs, 7,58 vs. 0,04 for ANTI verbs), which makes the former feel more natural to native speakers. Given these large frequency differences, we indeed might have expected a larger difference in ratings between the ATK-Ns and their corresponding ING-Ns (or a significant effect of nominal frequency); however, although ING-Ns are less frequent, *-ing* is the more productive suffix, which may have thus increased the acceptability of nominals with this affix. Comparatively, in the competition between Zero-Ns and ING-Ns among the Zero verbs, ING-Ns are rated somewhat higher (and more similarly to their Zero-N competitors at 0,557 for ANTI and 0,289 for CAUS). This may reflect the fact that competition between the two suffixes is more balanced: zero is more restricted than *-ing* but not so entrenched in these nominalization patterns as ATK. Additionally, both zero and *-ing* are native/Germanic suffixes.

The second important observation about the results concerning ING-Ns is that they challenge prediction (12b). With both types of verbs, ING-Ns built from anticausative verbs are similarly rated to those built from causative verbs. We do not find any indication that causative readings should be preferred for *-ing*, as claimed by Borer (2013) and suggested by others.

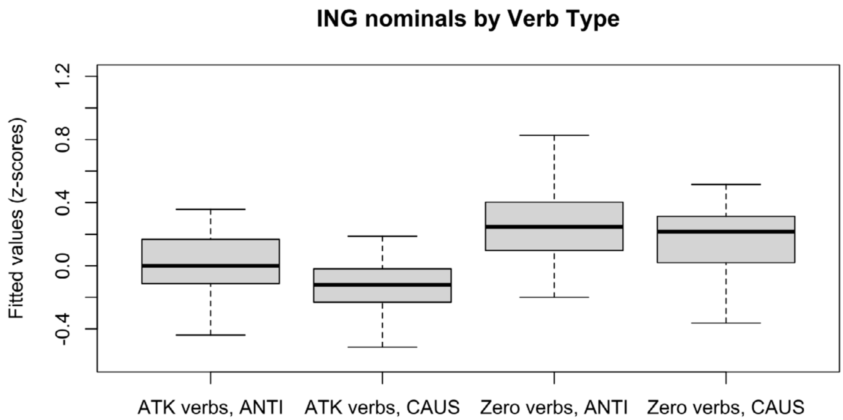

FIGURE 4. Fitted values for ING-Ns by Pair and Verb Type

Nominalization	Mean	SE
ATK verbs, ING, ANTI	0,008	0,165
ATK verbs, ING, CAUS	−0,134	0,165
Zero verbs, ING, ANTI	0,275	0,165
Zero verbs, ING, CAUS	0,158	0,165

TABLE 5. Means for ING-Ns

5 CONCLUSIONS AND FUTURE WORK

In this study we collected acceptability judgments on English nominalizations derived from causative and anticausative/unaccusative verbs in order to test previous theoretical claims according to which, first: zero nominalizers should not be able to realize causative event readings, and second: the suffix *-ing* should show a restriction with respect to anticausative readings and allow only causative ones. Both suffixes are expected to contrast with the ATK Romance suffixes, which are compatible with both types of verbs.

The results of this study support the observation about the flexibility of ATK-Ns in accepting both causative and anticausative readings. However, they disconfirm the other two expectations, in that no difference was found between the three different types of nominalizations: all three of them are equally possible with both causative and anticausative verbs. While some numerical differences do show up in our data, further investigations are necessary to verify whether they may become significant in a greater pool of data.

In conclusion, our results indicate that Zero, ATK and ING are very similar in their possible interpretation with respect to their derivation from causative and anticausative base verbs. All three suffixes may realize both the simpler anticausative/unaccusative and the more complex causative structures of their base verbs. Theoretically, this speaks in favor of treating Zero as a suffix, like the overt ones. However, this does not mean that these suffixes are semantically identical, as there may be other differences between them (e.g., *-ing* cannot denote states, while zero and ATK can; see Iordăchioaia & Werner, 2019).

There are a few shortcomings of this study, which we aim to overcome in our follow-up research. First, although the results support our guiding hypothesis, this is the null hypothesis, and in view of the small number of verbs tested, the absence of any statistically significant patterns may simply be the result of too little statistical power. In order to further assess these results, two additional studies may prove helpful. First, we will run a larger acceptability judgment study, aiming to investigate whether Zero-Ns which appear to inherit argument structure are *consistently* (relatively) acceptable in eventive contexts, regardless of whether they encode argument structure. We will do this by comparing these Zero-Ns to those which form Res-Ns, embedding them in sentences with the predicates tested here (*occur, take place, happen*). In principle, the Res-Ns should be significantly less acceptable in these contexts; thus, if there is a clear difference, then this would support the idea that some Zero-Ns can indeed form ArgStr-Ns, and that their relative acceptability is not purely the result of coercion or repair.

Second, we aim to run a forced-choice study in which we will provide causative vs. anticausative contexts (including alternating verbs) and ask participants to select one of the two competing nominalizations (which in the current study have been rated as acceptable). If a nominalization pattern has a clear preference for one reading or the other, this task should reveal it, especially as forced choice tasks have been shown to have greater statistical power than Likert-scale tasks (Sprouse & Almeida, 2017). This future work may therefore help to more clearly reveal any differences between types of nominalizations and the contexts in which they can appear.

Acknowledgements

We thank our student assistants Anna-Lena Feichter, Mariya Kavaldzhieva and Nina Richter for help in the preparation of the experiment, and Iordăchioaia acknowledges the Spanish Ministry of Science, Innovation and Universities' project PID2020-119851GB-I00 based in the University of Granada.

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APPENDIX

A. FREQUENCIES (OED, # PER MILLION OCCURRENCES)

A.1 BASE VERBS

Pair Type	Verb Type	Mean	SD
ATK Verbs	CAUS	61,25	92,77
	ANTI	26,30	28,63
Zero Verbs	CAUS	27,88	48,28
	ANTI	78,25	92,36

A.2 NOMINALIZATIONS

Pair Type	Verb Type	Suffix	Mean	SD
ATK Verbs	CAUS	ATK	22,75	25,91
		ING	0,05	0,03
	ANTI	ATK	7,58	8,61
		ING	0,04	0,04
Zero Verbs	CAUS	Zero	9,55	13,77
		ING	0,26	0,43
	ANTI	Zero	20,25	17,90
		ING	1,30	1,45

B. OUTPUT OF LINEAR MIXED EFFECTS MODEL

B.1 MODEL STATISTICS

Effect	**Estimate**	**SE**	***t***
Intercept	0,008	0,165	0,05
Pair Type[Zero verbs]	0,267	0,231	1,16
Verb Type[CAUS]	–0,142	0,231	–0,61
Suffix [Other]	0,269	0,231	1,16
Pair Type [Zero verbs]:Verb Type[CAUS]	0,025	0,326	0,08
Pair Type[Zero verbs]:Suffix[Other]	0,013	0,326	0,04
Verb Type[CAUS]:Suffix[Other]	0,118	0,326	0,36
Pair Type[Zero verbs]: Verb Type[CAUS]:Suffix[Other]	–0,269	0,461	–0,58
Random effects	**Variance**	**SD**	
Subject (intercept)	0,025	0,16	
Item (intercept)	0,088	0,30	
Residual	0,435	0,66	

Note: Contrasts were treatment coded with ATK verbs, ANTI, and ING as the reference levels.

B.2 LEAST-SQUARES MEANS

Pair Type	**Verb Type**	**Suffix**	**Mean**	**SE**
ATK Verbs	CAUS	ATK	0,253	0,165
		ING	–0,134	0,165
	ANTI	ATK	0,276	0,165
		ING	0,008	0,165
Zero Verbs	CAUS	Zero	0,289	0,165
		ING	0,158	0,165
	ANTI	Zero	0,557	0,165
		ING	0,275	0,165