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The role of accentedness in acceptability judgements in L3 Norwegian: an across-domain investigation

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ABSTRACT

Foreign-accented speech has been explored from various perspectives, yet the current study is one of the first to investigate the role of accentedness in relation to acceptability judgements in multilingual acquisition. We consider possible interactions of two domains, phonology and syntax, by presenting learners of L3 Norwegian with an Acceptability Judgement Task focusing on eight morphosyntactic properties. Stimuli were recorded with Polish, English and native Norwegian accents. The rationale of the study is based on activation competition; it is expected that a Polish or English accent may enhance activation of syntax of the relevant language and thus affect acceptability judgements. Test items were selected based on their grammatical similarities or dissimilarities between Norwegian and the two previously acquired languages, Polish and English. Prerecorded sentences were evaluated for grammaticality on a 7-point Likert scale. Participants included L1 Norwegian controls and L1 Polish–L2 English–L3/Ln learners of Norwegian divided into instructed and immersive groups. Results show significant effects of accent, group, and condition/grammaticality, as well as a significant group by condition/grammaticality interaction. Conditions not similar to Polish and English did not exhibit accent effects. Findings suggest that differences in ratings based on accentedness are linked to structural similarity and exposure conditions.

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Accentedness; acceptability judgement; phonology and syntax; L3 acquisition

Introduction

Foreign-accented speech, due to its significant social and pedagogical implications, has been widely researched from various angles, featuring sociolinguistic, experimental, and theoretical perspectives (e.g. Rodriguez-Cuadrado & Romero-Rivas, 2023). The concept of 'foreign accent' commonly refers to segmental and prosodic deviations from the native pronunciation norms exhibited by non-native language users. Generally,

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it is assessed holistically by raters on the basis of such rating parameters as the degree of foreign accent, speech intelligibility and/or acceptability (see Kiełkiewicz-Janowiak & Wrembel, 2020 for an overview).

The ratings of perceived global foreign accent have been widely applied in second language acquisition (SLA) research; yet accentedness is a complex construct and it is very difficult to assess it unidimensionally on a simple scale or to assign it to specific categories. The main results of foreign accentedness ratings (FARs) tend to indicate that some degree of foreign accentedness does not necessarily preclude intelligibility. It is generally acknowledged that the degree of foreign accentedness may differ as a function of the characteristics of the subjects examined, including the L1 background, the L2 target and the amount of language experience (e.g. Piske et al., 2001).

Another variable which has been found to affect the level of perceived accentedness is the grammaticality of the speech samples (Munro & Derwing, 1995); however, phonological and syntactic errors which frequently coincide in foreign language learners are not easy to disentangle. Recent studies suggest that native speakers exhibit reduced sensitivity to grammatical violations in foreign-accented speech in comparison to native speech (Asano & Weber, 2016; Kędzierska et al., 2025; Wesolek et al., 2023). These conclusions based on FAR studies have been further confirmed by electrophysiological investigations, which indicate that (morpho)syntactic violations tend to be ignored during real-time non-native speech processing (Grey & van Hell, 2017; Hanulíková et al., 2012).

Research findings point to the interplay of several factors affecting the perception and processing of foreign accents, yet many questions remain unanswered. To the best of our knowledge, the role of accentedness has not been investigated in relation to syntactic and semantic acceptability judgements in multilingual acquisition; thus this contribution aims to fill this research void.

Previous research has shown that speakers' accents can provide information about speaker type and identity (Bradlow & Bent, 2008), and that perceptions about different speakers may also modulate speech processing. The impact of speaker accent on syntactic priming seems particularly relevant in today's global society, since foreign language learners may be exposed to various speakers with different language backgrounds and accents. Phonetic cues can influence how we process language, perhaps especially at the syntactic level. Prior work on phonetic cue-based syntactic activation has been rather limited, with a notable exception of Chun and Kaan (2022), who investigated to what extent L2 speakers' syntactic priming is influenced by different accents and familiarity with those accents. The study involved Korean learners of L2 English, whose task was to describe pictures of ditransitive events after having listened to sentences recorded by three speakers of English with different accents: a native American accent and two non-standard accents (Korean, English and Indian English). The results demonstrated that the L2 participants' structural priming for each construction changed over time and was modulated by the speakers' accents and the participants' familiarity with those accents. However, there is a scarcity of research into the effects of accentedness on L2 syntactic processing and to our knowledge, there is no such study from a multilingual perspective; thus, the present study contributes to the understanding of this phenomenon.

The current models of L3 acquisition, and consequently also most studies that have been carried out so far, have focused on the linguistic source of Cross-Linguistic Influence (CLI), i.e. whether it is from only one of the previously acquired languages,

and if so, which one, or whether it could be from both. While the L2 Status Factor (L2SF) (Bardel & Falk, 2007) and the Typological Primacy Model (TPM) (Rothman et al., 2019) assume that CLI is (mainly or solely) from one of the previously acquired languages (at early or 'initial stages' of development), the Cumulative Enhancement Model (CEM) (Flynn et al., 2004), the Linguistic Proximity Model (LPM) (Westergaard et al., 2017), the Scalpel Model (Slabakova, 2017) and the Natural Growth Theory of Acquisition (Dziubalska-Kołaczyk & Wrembel, 2024) argue that both languages are active and in competition for CLI (see e.g. Rothman et al., 2019 for an overview). The decisive factors determining which language is selected or most active for CLI are considered to be order and manner of acquisition (the L2SF) or lexical and structural similarity between the L3 and one of the previously acquired languages (the TPM, CEM, LPM and Scalpel Model) (see Flynn et al., 2004; Rothman, 2015; Slabakova, 2017; Westergaard et al., 2017). Furthermore, most studies also focus on one domain, typically morphosyntax or phonology, and studies that consider several domains are the exception (e.g. Jensen et al., 2021).

In the present study, we consider the possible interaction of two domains, phonology and syntax, by presenting learners of L3 Norwegian who have Polish and English as their previously acquired languages with an Acceptability Judgement Task (AJT) with stimuli where a property of L3 Norwegian is either similar to Polish and different from English or vice versa (see Westergaard et al., 2023 for the selection of properties for such a design). The stimuli are spoken with a Polish, an English, or a native Norwegian accent. The rationale of the study is based on the idea of activation competition as it is argued for in the LPM and the Scalpel Model (see e.g. Westergaard, 2021a, 2021b), and thus, that a Polish or English accent may enhance the activation of the syntax of the relevant language and consequently affect the acceptability judgment given.

Specifically, we ask whether speakers will provide different judgements for the same morphosyntactic phenomenon depending on accent, so that a grammatical Norwegian structure that is similar to Polish (and different from English) may be more acceptable with a Polish accent and less acceptable with an English accent, assuming that the native accent is the baseline. Likewise, a grammatical Norwegian structure that is ungrammatical in English may be less acceptable with an English accent than with a Polish accent. The reason for this is that English morphosyntax may be more strongly activated with the English accent and correspondingly, Polish more activated with the Polish accent. Thus, ungrammatical Norwegian structures which are also ungrammatical in Polish should be even less acceptable with a Polish accent than an English accent, and vice versa for ungrammatical structures that are similar to English (see Table 1).

Table 1 presents the general predictions based on structural similarity between Norwegian and English or Polish, combined with accent-based expectations. For structures that are ungrammatical in Norwegian, the predictions hinge on whether the same structure is also ungrammatical in one of the other languages (*Similarity*). If an ungrammatical

Table 1. General predictions.

	Grammatical in Norwegian		Ungrammatical in Norwegian	
Similarity	English	Polish	English	Polish
Native accent	Baseline judgements			
English accent	+	–	–	+
Polish accent	–	+	+	–

Note: + stands for more acceptable; – stands for less acceptable (than the baseline)

structure is *similar* to English, this means it is also ungrammatical in English. In such cases, the English accent is expected to reinforce the correct judgment, resulting in lower acceptability. In contrast, the same structure is grammatical in Polish; thus, a Polish accent could activate Polish grammatical knowledge, increasing acceptability of a structure that is ungrammatical in the target language.

Methodology

Experimental conditions

The test items in the AJT covered eight syntactic conditions, selected based on their grammatical similarities or dissimilarities with target Norwegian. Specifically, three conditions in Norwegian mirrored grammatical structures in Polish and three in English. The remaining two conditions were dissimilar from both previously acquired languages; that is, the grammatical structures in Norwegian were not grammatical in either Polish or English. This means that for the two conditions that are dissimilar for both previously acquired languages, the ungrammatical version of the test item is grammatical either in both the L1 and the L2 or in the L1 only.

We refer to the test items as Polish-like or English-like. Table 2 shows an overview of the conditions and their similarity to the grammatical structures of Norwegian, including two conditions without similarity. Each condition is explained in turn and exemplified below.

Each tested item consisted of a context and a test sentence. The context was given to the participants in written form, whereas the test item was in aural form (see procedure). The context was essential to ensure that the test item was understood as intended.

Polish and Norwegian possessive pronouns work similarly, because both languages have a reflexive as well as a 3rd person possessive, while English only has the latter. Both the grammatical and the ungrammatical versions of the sentence are similar to Polish, i.e. the ungrammatical sentence in Norwegian is also ungrammatical in Polish. We thus tested the condition in which the reflexive possessive is the felicitous item (1b).

1. a. Erik og Karen fikk julegaver. Context
   Eric and Karen got Christmas_presents
   'Eric and Karen got Christmas presents.'
   b. Erik åpnet gaven sin først.
   Eric opened gift-the his-refl first
   'Eric opened his gift first.'
   c. *Erik åpnet gaven hans først.
   Eric opened gift-the his-3rd first
   'Eric opened his gift first.'

Table 2. Overview of tested conditions.

Condition	Grammatical in Norwegian	Ungrammatical in Norwegian
Possessives/Reflexives	= POL	ENG
TD generic	= POL	ENG
Indef. art. with professions	= POL	ENG
Kind	= ENG	POL
Definiteness	= ENG	POL
Ditransitive	= ENG	POL
Abstract nouns	POL/ENG	= POL/ENG
Object shift	POL/ENG	= POL/ ENG

The Professions condition (2) tested the target NPs using both bare and indefinite forms. Norwegian employs the bare form for professions (e.g. 'teacher', 'engineer'), similar to Polish, which lacks articles. This contrasts with English, which requires an article for count nouns.

2. a. Kjæresten min må alltid jobbe i helgene Context
boyfriend my must always work in weekends-the
'My boyfriend must always work on the weekend.'
b. Han er dørvakt.
He is bouncer
'He is a bouncer.'
c. %Han er en dørvakt.
He is a bouncer
'He is a bouncer.'
(% indicates variation)

The last condition where Polish and Norwegian share a grammatical feature is Type-denoting generics (3). Generic expressions are used to categorise and depict regularities in the environment through generalising over classes of entities or events (Carlson & Pelletier, 1995; Krifka et al., 1995). The term type-denoting was first used by Heim (1982) to convey that nominal expressions can be used to name a type of entity (or substance). Here we use this term in line with what Borthen (2003) refers to as type-emphasising for Norwegian. Recent empirical research has shown that bare singular NPs in Norwegian are highly accepted in this condition, but the indefinite NP is not rejected, as the two are grammatical but differ in nuances of meaning (Velnić et al., 2025).

3. a. Det er viktig å holde seg hydrert under en fjelltur Context
it is important to hold self hydrated during a mountain hike
'It is important to keep yourself hydrated on a mountain hike.'
b. Det er viktig å ha vannflaske
it is important to have water bottle
'It is important to have a water bottle.'
c. %Det er viktig å ha en vannflaske
it is important to have a water bottle
'It is important to have a water bottle.'

Next, we examined test items that align in grammaticality with English, focusing on definiteness (4). Both Norwegian and English utilise articles to denote definiteness, despite structural differences – Norwegian uses a postposed definite suffix, while English has the definite article *the*. However, the semantic function of the definite article remains similar across the two languages. We evaluated definiteness through contexts of second mention and uniqueness, with test items sourced from Jensen (2022).

4. a. Susanne har en lat katt Context
Susan has a lazy cat
'Susan's cat is lazy.'
b. Katten sov mye.
cat-the sleeps a lot
'The cat sleeps a lot.'
c. *Katt sov mye.
cat sleeps a lot
'The cat sleeps a lot.'

Another investigated syntactic property in which English and Norwegian are alike is the ditransitive structure (5). In this study, we focus on the prepositional dative, as this is a point of divergence between Norwegian and English on the one hand and Polish on the other. Polish is an inflectionally rich language and with the use of case, a preposition is not required.

5 a. Isak våknet av at en katt mjauet under balkongen Context
Isak awoke from that a cat meowed under balcony-the
Den var så søt og så veldig sulten ut.
it was so sweet and looked very hungry our
'Isac was awoken by a cat meowing under the balcony. She was sweet and looked hungry.'
b. Han ga tunfisk til katten.
he gave tunafish to cat-the
'He gave the cat some tuna.'
c. *Han ga tunfisk katten.
he gave tunafish cat-the
'He gave the cat some tuna.'

The expression of Kind generics is another point of similarity between English and Norwegian (6). These generics describe a kind as an abstract individual (Krifka et al., 1995). Kind generics are arguably best expressed by means of the definite article in English (Carlson & Pelletier, 1995; Mari et al., 2012). This has recently also been confirmed for Norwegian (Velnić et al., 2025). We contrast the generic definite article with its absence, thus using a bare singular noun as its counterpart, which is comparable to Polish. However, note that while Velnić et al. (2025) found that a definite NP had a high acceptance rate in kind conditions and the bare NP was rejected significantly more, the latter was still accepted at roughly 50%. This is related to the Norwegian bare singular being number neutral (Halmøy, 2010) and type-emphasising (Borthen, 2003); thus, a good fit for generic interpretations.

6. a. Mange dyr har lidd under skadene av forurensning Context
many animals have suffered damages-the of pollution
'Many animals have suffered from pollution.'
b. Elefanten er utrydningstruet.
elephant-the is endangered
'The elephant is endangered.'
c. *Elefant er utrydningstruet.
elephant is endangered
'The elephant is endangered.'

The last two conditions are structures in which Norwegian is dissimilar from both previously acquired languages, abstract nouns and object shift. This means that the ungrammatical version of the item will be both Polish and English-like (for abstract nouns), or only Polish-like (for object shift). We included these conditions as we expected there to be no difference between the Polish and English accents in these cases, as the syntax activated by the two accents would be the same (in the grammatical version of the Norwegian sentences). Abstract nouns (e.g. *childhood*, *time*) require the definite marker in Norwegian (7), but the bare form in English. The bare form is also the used in Polish, since there are no articles.

7. a. Plutselig er barna voksne Context
suddenly are children-the grown
'Suddenly, the children have grown up.'

b. Tiden går så fort.
time-the goes so fast
'Time goes by so fast.'
c. *Tid går så fort.
time goes so fast
'Time goes by so fast.'

The last condition (8) in our study, object shift, is a construction where pronominal objects are 'shifted' past negation (see e.g. Holmberg, 1986). In the other two languages, pronominal objects do not undergo this type of shift and appear in the same position as nominal objects.

8. a. Erlend dro til bokhandelen for å kjøpe en bok om isbreer Context
Erlend went to bookstore-the for to buy a book about glaciers
'Erlend went to the bookstore to buy a book about glaciers.'
b. Han fant den ikke i butikken.
he found it not in store-the
'He didn't find one in the store.'
c. %Han fant ikke den i butikken.
he found not it in store-the
'He didn't find one in the store.'

Materials

Thirty-eight items were selected per accent. The Norwegian test sentences were read by native speakers of Norwegian, English, and Polish. The sentences were intelligible yet accented. Half of the sentences were grammatical, half ungrammatical in the target language. The sentences represented the eight different syntactic conditions: Possessive ($N = 6$), TD-generic ($N = 4$), Professions ($N = 4$), Kind ($N = 4$), Definiteness ($N = 4$), Ditransitive ($N = 6$), Abstracts ($N = 4$), Object shift ($N = 6$). Due to the high number of conditions and accents tested in this experiment, it was felt participants would be overburdened if asked to evaluate more than 4 test items per condition. We made an exception for three conditions where we expected judgments to vary more widely. Each participant never heard the grammatical and ungrammatical version of the same sentence.

The equipment used for the recordings involved a Shure SM-35 unidirectional cardioid head-worn condenser microphone. The signal was digitised at 48 kHz, 16 bit, using a portable Marantz PMD620 solid state recorder. The recordings were then normalised using the Audacity software to achieve a LUFS (Loudness Units Full Scale) level of −23 dB.

The preselection of target recordings consisted of foreign accent ratings (FAR) performed on a larger pool of speakers. Nine female speakers (i.e. three speakers per accent) were recorded reading test items in order to select the best samples from one speaker per accent. The preliminary FAR were performed online via Qualtrics by a pool of native Norwegian speakers (of which 16 completed the whole survey). They were asked to listen to the nine speech samples in Norwegian and evaluate the degree of foreign accent on a 7-point rating scale (1 – strongly accented, 7 – native-like). The survey took approximately 10 min. Based on the results of the preliminary FAR, we selected one speaker per accent. We selected the speakers which were most comparable to one another on the scale (i.e. that raters perceived to have the same degree of foreign accentedness), making sure that these were rather medium rather than strongly accented speech samples. The selected Polish and English-accented Norwegian speech samples

were thus balanced for the degree of foreign accentedness, with an average result of 4.5 on the 7-point scale (7 = native-like).

Procedure

An online experiment was conducted in Qualtrics. It involved self-paced listening to sentence items presented auditorily and an Acceptability Judgment Task. Each item was preceded by an individual context sentence presented in writing, which the participants had to read first. Then they listened to a prerecorded sentence that was to be evaluated for grammaticality on a 7-point Likert scale (1 – ungrammatical, 7 – grammatical). The experiment instructions were provided in Norwegian. Three different sentence lists were created for three accent conditions.

The experiment started with a practice session which consisted of four training items. Once the training session was completed, the experiment began. There were three accent blocks, i.e. Polish-accented Norwegian, English-accented Norwegian, and native Norwegian. Each accent block included 38 items. The order of items within the accent block was randomised.

The language blocks were pseudo-randomised, i.e. every other participant would start with the Polish-accented block and end with the English-accented block, or the other way around, counterbalanced between participants. The Norwegian native-accented block was always the middle block. We did this because we consider the native Norwegian block as a neutral condition in which we do not expect the accent to activate one of the previously acquired languages more than the other, thus acting as a 'palate cleanser' between our two key conditions.

Each of the blocks was separated by a pause slide, when the participants could take a break. The evaluation part was followed by a background questionnaire containing questions related to linguistic background, language history and use, other languages spoken, age, and place of residence. The third part involved a multiple-choice Norwegian proficiency test consisting of 15 items. The proficiency test used was an adapted version (measuring proficiency up to the A2 level) of the Norwegian placement test used at UiT The Arctic University of Norway.

The experiment was administered to three groups of participants ($N = 83$), i.e. instructed L3 Norwegian learners, naturalistic L3 Norwegian learners, and Norwegian native controls. The instructed learners resided in Poland and were students of Norwegian studies from two Polish universities. The naturalistic learners were Polish people residing in Norway.

The presented research received the necessary ethics approval from the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University, Poznań (No 1/2022/2023).

Participants

The learner groups featured L1 Polish–L2 English–L3/Ln Norwegian users who were subdivided into two groups: instructed ($N = 27$) and naturalistic learners ($N = 28$). The former were learning L3/Ln Norwegian in a formal setting at two Polish universities (the University of Szczecin and Poznań College of Modern Languages), majoring in Norwegian within

a BA programme. Their mean age was 23.11 years and their proficiency level in Norwegian was at 85.16% on the adapted Norwegian placement test (which corresponds to approximately A2 level). Fewer than a half ($N = 12$) declared familiarity with foreign-accented speech in Norwegian. The majority ($N = 21$) did not use Norwegian on a daily basis.

The naturalistic learner group resided in Norway at the time of the experiment. Their mean age was 37.46 years and their proficiency level in Norwegian was at 85.12% (as measured by the same Norwegian proficiency test). More than a half ($N = 20$) declared familiarity with foreign-accented speech in Norwegian. The majority ($N = 24$) used Norwegian on a daily basis. The Norwegian native control group consisted of 28 participants, with a mean age of 33.43 years. The majority ($N = 23$) declared familiarity with foreign-accented speech in Norwegian and all used Norwegian on a daily basis. The participants' profiles are summarised in Table 3.

Predictions

As stated in the Introduction (Table 1), our main prediction is that the accent the participants hear may activate the relevant grammar to a higher degree and thus affect the ratings. Structural similarity should interact with activation. More specifically, we expect an effect of a Polish accent for test items similar to Polish, compared to how the participants judge the same items with a neutral (or English) accent. Let us exemplify with the Ditransitive condition: The participants hear two structures, DO-IO and DO-prepIO, the former structure similar to Polish, the latter to English. When they hear these with a neutral Norwegian accent, we expect them to rate DO-prepIO higher than DO-IO, since the former is grammatical in Norwegian and they have been exposed to the structure in their Norwegian experience. This is our baseline for this condition. We then expect a Polish accent to activate Polish syntax, so that (ungrammatical) DO-IO with a Polish accent will be rated comparatively higher *than their own baseline rating* and, possibly, comparatively lower with an English accent. For grammatical DO-prepIO, we expect the opposite: This will be rated higher than the baseline with an English accent (because English syntax is now activated more) and lower than with a Polish accent. Of course, the potential English accent effect is dependent on the participant's proficiency in English. If the learners are already rating this construction at ceiling, the accent-based differences will be lost. Native control ratings will serve as a litmus test for the potential acceptability of particular ungrammatical structures, since we expect different native ratings on the different conditions. Further, we predict that there would be differences across conditions, depending on frequency and complexity.

Our final prediction, which diverges from the main focus of the paper, is related to the results of recent studies which show that the learning setting can influence the

Table 3. Participant biographical information.

	Native Norwegian controls	Immersive learners	Instructed learners
Number	28	28	27
Age	33.43	37.46	23.11
Proficiency in Norwegian	C2	A2	A2
Proficiency in English	B2/C1	B1/B2	B1/B2
Familiarity with accented speech	no = 5, yes = 23	no = 8, yes = 20	no = 15, yes = 12
Use of Norwegian on a daily basis	yes = 28	yes = 24, no = 4	yes = 6, no = 21

perception of foreign sounds (e.g. Georgiou, 2021; Kędzierska et al., 2025). We may assume that the performance of instructed learners will differ from that of immersive learners and that the latter may be expected to align more with the Norwegian native controls in terms of accuracy of responses, i.e. immersive learners may be expected to make more categorical judgements between grammatical and ungrammatical sentences. This hypothesis is based on the assumption that immersive learners receive more target-like input, which makes them more sensitive to Norwegian grammatical patterns. However, due to the scarcity of clear indications from previous research to date this claim remains rather tentative.

In the subsequent analysis, the dependent variable constituted grammaticality ratings in L3 Norwegian based on audio stimuli presented with one of the three accent conditions (i.e. native Norwegian, Polish-accented, and English-accented). The independent variables included are as follows:

- Accent (Polish-accented, English-accented, native Norwegian)
- Structural similarity (Polish, English, no similarity)
- Grammaticality (grammatical, ungrammatical)
- Condition (eight syntactic feature and semantic readings under investigation)
- Group: L3 learner groups (instructed + naturalistic)

Further details regarding the applied statistical analyses are presented in the *statistical analysis* section below.

Results

Descriptive statistics

Figures 1–3 plot the mean ratings and standard errors by condition, grammaticality, and accent for the three groups in our study: Native Norwegian speakers, instructed and immersive L3 learners of Norwegian. The first three columns present the conditions where Norwegian and Polish are structurally similar, the next three columns give the conditions where Norwegian and English are similar, and the last two columns show the conditions where the three languages work differently. The results should be interpreted with reference to Table 2, which presents linguistic similarities of the syntactic conditions for grammatical and ungrammatical test items. The mean ratings for each condition are available on the OSF.

Figure 1 illustrates that native Norwegian speakers exhibit more categorical distinctions when listening to speech in a neutral (native) accent (see middle row) when compared to accented speech. The distinctions are categorical for the Definiteness and Ditransitive position, reflecting ungrammaticality rather than infelicitousness. For some conditions (Professions, Kind, Abstracts, and Object shift) there is an expected high acceptance of the grammatical condition, but strong variation in how the conditions deemed ungrammatical are accepted. For the Possessive condition, there is a divide in judgment between the grammatical and ungrammatical condition, but the judgments vary for both categories. This variability may be linked to recent observations suggesting that the Norwegian possessive system is undergoing a change (documented for Swedish in Julien, 2020), with third-person possessives increasingly supplanting reflexive forms (Marit Westergaard, p.c.). These

judgment patterns persist even under accented speech conditions, although responses to both grammatical and ungrammatical constructions become more varied, i.e. compare the Definiteness and Ditransitive conditions in the middle row to the rows above and below: this elongation indicates a broader range of response patterns.

From these observations, we can conclude that Norwegian natives are affected by accented speech. Given that the primary focus of this study is how accentedness affects the L3, we will not focus on the native controls in subsequent analyses.

Figure 2 illustrates the response patterns of the immersive L3 group. As anticipated, the learner group demonstrates greater variability in responses compared to native speakers. However, this observation lies beyond the scope of the present study. The focus here is on comparing responses within the same group across the three accents. While a thorough statistical analysis is provided in the following section, simply eyeballing the columns in the figure reveals notable variation in judgments across the accents.

Visually, there are differences between the baseline condition and the accented conditions. However, the two accented conditions appear to have a similar impact on the participants' judgments, particularly in the Polish-similar conditions. This suggests that participants are influenced by the presence of an accent but not necessarily by the specific type of accent. Subsequent statistical analyses will determine whether subtle differences exist. In the English-similar conditions, grammatical items (grammatical in Norwegian but ungrammatical in Polish) elicit more varied judgments when produced with a Polish accent. This variability indicates that these items are perceived as less grammatical, which might be linked to activation of the Polish linguistic system.

Figure 3 presents the results of our instructed learners. In the first three columns, where Norwegian shares similarities with Polish, the English-accented condition exhibits longer

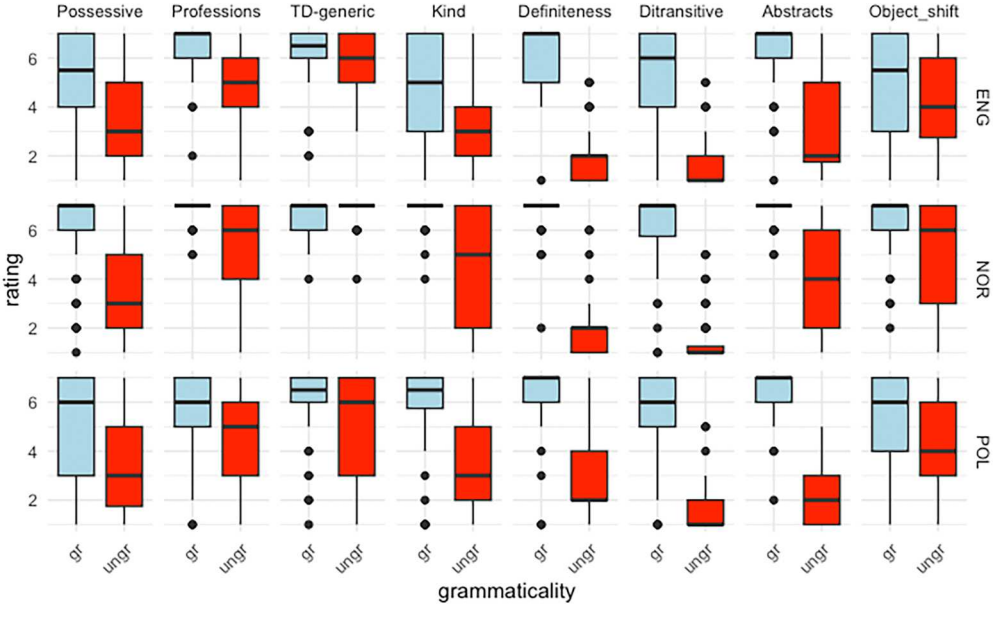

Figure 1. Means and standard errors by condition, grammaticality and accent for the native speakers.

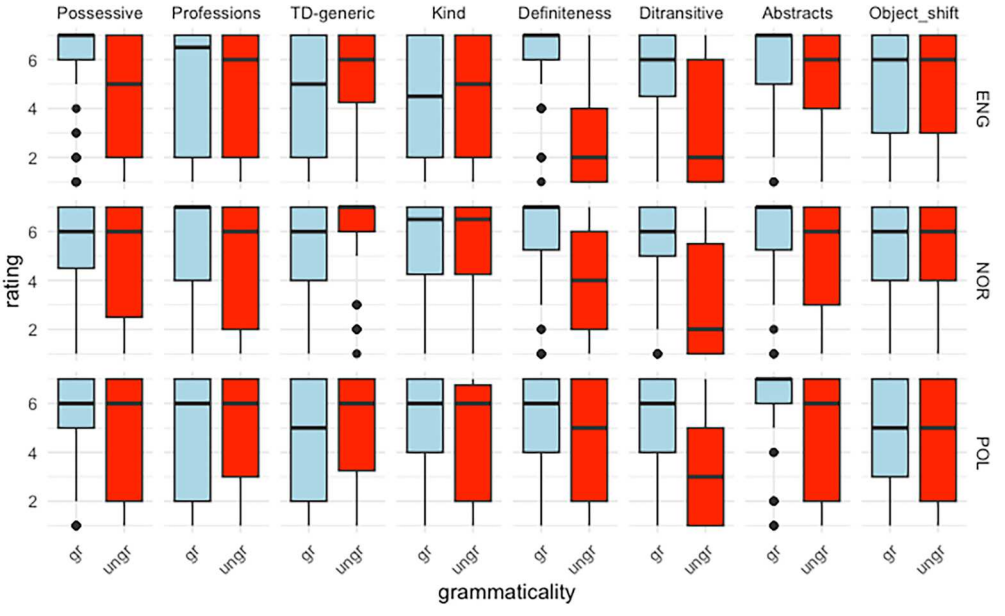

Figure 2. Means and standard errors by condition, grammaticality and accent for the immersive learners.

boxplots for grammatical structures (i.e. grammatical in Norwegian but ungrammatical in English). This suggests that the ungrammaticality of these structures in English may influence participants to assign lower judgments. For the next three rows – Kind,

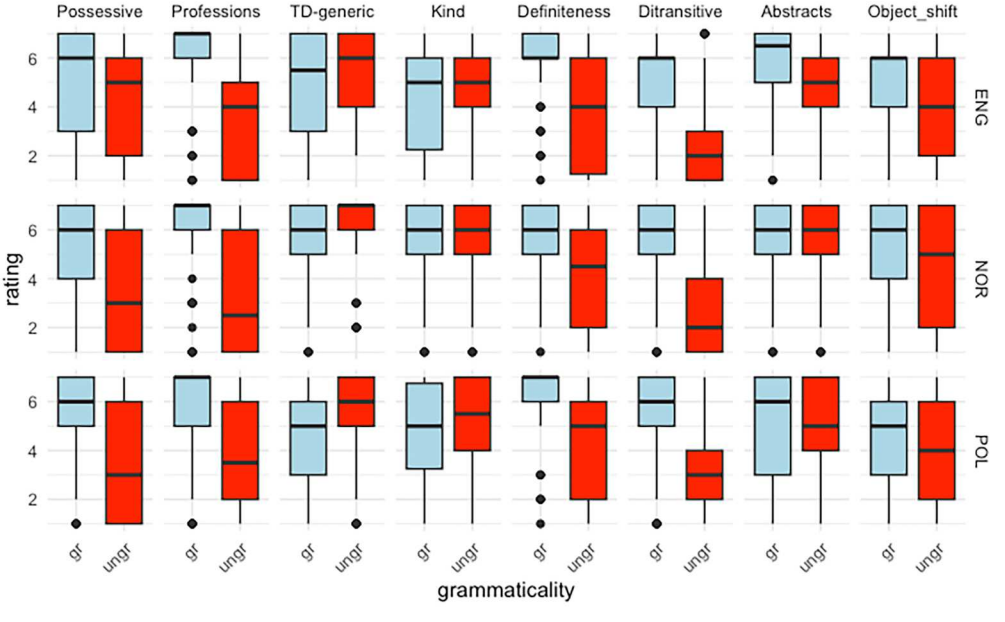

Figure 3. Means and standard errors by condition, grammaticality and accent for the instructed learners.

Definiteness, and Ditransitive – both accented conditions deviate in the rating patterns from the baseline Norwegian accent in a parallel manner.

Statistical analysis

All statistical analyses were conducted using R (R Core Team, 2022). We fitted a cumulative link mixed model from the *ordinal* package (Christensen, 2023) to assess naturalistic and instructed Polish speakers' perception of grammaticality based on accent across conditions (i.e. definiteness, object shift, etc.). This model type was chosen as the response variable represented an ordinal scale (Likert scale). We merged condition and grammaticality (grammatical, ungrammatical) together to create sixteen new conditions within one variable, condition grammaticality (CG). Rating was predicted as an interaction of accentedness (Polish, English, Norwegian), CG, and language acquisition setting (formal, naturalistic). Participant and test item were included as random effects (clmm(rating ~ accent * CG * group + (1|participant) + (1|test_item), data = data_sep)). The *emmeans* package (Lenth et al., 2023) was then used to examine pairwise contrasts for accents within each condition/grammaticality condition and for each group (immersive and instructed). Using pairwise contrasts in this way allows for both comparisons between ratings for English- and Polish-accented sentences, as well as between foreign-accented sentences and Norwegian-accented sentences. For all analyses, effects were considered significant if *p*-values were less than .05. Prior to these analyses, we excluded one participant who was not Norwegian or Polish and who scored less than 20% in the proficiency test. The statistical coding is available on the project OSF.[1]

The model's total explanatory power is substantial (conditional R2 = 0.245), and the part related to fixed effects alone (marginal R2) is of 0.144. The *joint_tests* function from the *emmeans* package was used to evaluate the significance of the fixed effects (main and interactions) in the model (Lenth et al., 2023). The effects of accent, condition/grammaticality, group, and condition/grammaticality and group are significant (see Table 4).

Post-hoc pairwise analyses reveal some relationships between the condition and accent in terms of acceptability judgements in the two groups. We report only the statistically significant relationships here (the full output of the *emmeans* command can be found in Appendix).

Immersive learners

To determine whether L1 Polish speakers would differ in their perceptions of grammaticality based on accent, we used *emmeans* to make a direct comparison. We found a relationship between accent and condition relating to Polish- and English-accentedness in one condition for immersive learners. In the definiteness ungrammatical condition, the effect of the English accent is significant and negative when compared with the Polish accent (estimate = −1.36, SE = .45, *z*.ratio = −3, $p = .008$). That is, sentences with nouns without an article were rated *lower* when the Norwegian sentences were English-accented as opposed to Polish-accented. Stated differently, article-less noun phrases were considered more acceptable when spoken with a Polish accent.

Unexpectedly, there is also a statistically significant relationship between the ratings for English and Norwegian accents in this condition. Norwegian sentences without an article are also rated lower when they are spoken with an English accent as opposed to

Table 4. Main effects and interactions.

Model term [A17]	df1	df2	*F* ratio	*p* value
Accent	2	Inf	11.59	<.0001
CG	15	Inf	28.19	<.0001
Group	1	Inf	3.54	0. 06
Accent:CG	30	Inf	1.15	0.26
Accent:Group	2	Inf	1.648	0.19
CG:Group	15	Inf	4.24	<.001
Accent:CG:group	30	Inf	1.22	0.19

a Norwegian one (estimate = −1.08, SE = .45, *z*.ratio = −2.4, *p* = .04). However, there is no difference between ratings for this condition for Polish and Norwegian accents (estimate = −0.28, SE = .45, *z*.ratio = −0.63, *p* = .8).

Instructed learners

The remainder of the significant relationships found between accent and condition occurred in the instructed learner group between Norwegian-accented and foreign-accented sentences. In the Kind grammatical condition (where Norwegian is like English), the effect of an English accent is significant and negative when compared with the Norwegian accent (estimate = −1.10, SE = .39, *z*.ratio = −2.79, *p* = .01). This does not align with our initial predictions.

A stipulative interpretation stems from a morphological difference that could be the reason for this unexpected result. The English definite article is a free morpheme preceding the noun, while the Norwegian definite article is a bound morpheme attached as a suffix. This is a major morphological difference, and when we are talking about the acquisition of genericity, it is only the morphological exponents of genericity that have to be adjusted in the new languages. Note that the same issue does not arise with the indefinite article.

In the TD-generic ungrammatical condition (where Norwegian is like Polish), the effect of the English accent is significant and negative (estimate = −1.07, SE = .41, *z*.ratio = −2.63, *p* = .02) compared with the Norwegian accent. Norwegian sentences were given a lower rating when they were English-accented as opposed to when they were Norwegian-accented.

Discussion

Our main research question for this study was whether phonology and syntax are linked in such a way that a foreign accent could affect acceptability judgements of morphosyntactic properties, which, in line with assumptions made in the Linguistic Proximity Model (Westergaard et al., 2017) and the Scalpel Model (Slabakova, 2017), could be argued to be due to a higher activation of the grammar that corresponds to the accent. The study is largely exploratory, throwing a wide net by evaluating the effect of accent looking at a number of linguistic properties. Our predictions were specified in Table 1, repeated here for convenience.

To start with, it is important to establish the validity of our complex test instrument. The native Norwegian speakers (see plots in Figure 1) restrict their high ratings to the grammatical test items, suggesting that they are acceptable in Norwegian. The

unacceptable test items in some conditions (Abstracts, Object Shift, TD generics) have a wider range of variation than in other conditions, pointing to some existing variability in the target language. It is also notable that the Norwegian native speakers are most categorical in their judgments when the test items are pronounced with a Norwegian accent, which is presumably due to a certain expectation that foreign speakers will make syntax errors. This could be related to previous findings by Hanulíková et al. (2012) that native speakers stop showing P600 effects when exposed to foreign-accented speech. Hopp (2016) also shows that native speakers stop using gender marking as a cue in eyetracking when they are exposed to ungrammatical sentences. However, the Polish and English accents do not throw them off completely, as they largely maintain the direction of their judgments. Interestingly, we are not seeing a statistical effect of the English accent in the native Norwegian group, although they all know English. In fact, Polish and English accents are judged about equally acceptable. We assume that due to their proficiency in the native language being so high, it does not matter for them whether the presented stimuli are foreign-accented or not. These observations suggest that our test instrument is functioning well. They also attest to the effect accent can have on acceptability judgments, even when hearing sentences in one's native language.

We would like to emphasise that we are not making comparisons across conditions, as there are too many grammar and frequency differences to contend with (cf. Jensen et al., 2021). Instead, we are considering possible effects of accent within condition. The condition that best supports our predictions is Definiteness marking (where Norwegian is similar to English). The reader should ascertain that this is a condition in which native Norwegian speakers offer categorically different evaluations (Figure 1), hence the native Norwegian input to which learners are exposed, as well as instruction, offers unambiguous, one-to-one mappings.

In the Definiteness condition, the instructed learners (Figure 3) accept the grammatical marking while not rejecting the ungrammatical version categorically. The immersive learners, however (Figure 2), made categorical judgments when they heard these test items with an English accent ($M_{DefEngUngram} = 3.91$, $M_{DefEngGram} = 5.85$). In fact, Norwegian sentences without an article are rated lower when heard with an English accent as opposed to when heard with a Norwegian accent ($p = .04$), while there is no difference between the Norwegian and Polish accents. In addition, the effect of the English accent is significant and negative when compared with the Polish accent (estimate = −1.36, $p = .008$). Thus, the fact that both English and Norwegian are languages with articles seems to have led to a combined (and thus stronger) activation of these languages, leading to a stronger rejection of article-less nouns. Alternatively, English definiteness marking may have had a stronger representation in these immersive speakers' competence, possibly because English and Norwegian definiteness marking are not identical morphologically, as we discussed above. It could thus be the case that Norwegian definiteness *marking* was not acquired completely, while the necessity to express definiteness *meaning* was triggered by the English accent.

Importantly, the activation of the Polish grammar through accent is clear in this condition more generally: a cumulative learner analysis (not reported in detail) where the two Polish groups were considered together established that test sentences without an article were rated higher when produced with a Polish accent compared to an English accent ($p = .03$). That is, the activation of Polish syntax (through the accent) may have

caused participants to accept these ungrammatical sentences. The reader is invited to consult the last but one column of Table 1 to check the confirmed predictions.

Our learners' behaviour is somewhat different in the Ditransitives condition. Both learner groups show a clear distinction between acceptable and unacceptable datives with all three accents, although the variance for unacceptable items is quite large for the immersive learners ($M_{DitUngram} = 3.17$, $M_{DitGram} = 5.53$). Thus, it appears that the necessity of the dative preposition in Norwegian has been successfully acquired.

But now we may ask why Ditransitives show no accent effect compared to Definiteness? We suggest that a syntactic distinction such as a dative preposition is salient enough, while definiteness marking is quite hard to master in additional language acquisition (e.g. Ionin et al., 2004). The general implication would be that if a property is structurally similar to one of the previously known languages that has been acquired to ceiling, no significant accent effects are expected, since the (transferred) grammatical representations are stable. We should also consider the fact that since Norwegian does not have case marking, simply removing the preposition does not necessarily make a sentence 'Polish-like', while having the preposition is clearly 'English-like'. Therefore, the participants are likely to accept the sentence type which they have in one of their previously acquired languages (English) and which they have learned in Norwegian. In this condition, the multilingual participants have high acceptance rates and mean rejection rates only slightly higher for Polish accent compared to the Norwegian accent.

In our experimental conditions, we included three properties where Norwegian and Polish worked similarly while English was different. In all of these conditions, we would expect the English accent of the recording to boost the acceptability of the unacceptable variants. The Possessives and Professions conditions (where Norwegian is like Polish) demonstrated the opposite of the Definites and Ditransitives (where Norwegian is like English). While this time the evaluations of the immersive group were largely flat and relatively high (Figure 3), the instructed learners were quite sensitive to the contrast with a Norwegian accent ($M_{PosUngram} = 3.52$, $M_{PosGram} = 5.40$, $M_{ProfUngram} = 3.40$, $M_{ProfGram} = 5.87$), although this distinction did not reach significance. The instructed learners in Poland demonstrated not only a better acquisition of the Possessives and Professions conditions, but also a (non-significant) English accent effect. Since the ungrammatical items in these two conditions (see examples (1c) and (2c)) were similar to English, they accepted the ungrammatical items more when the accent was English. This is in line with our predictions.

How did the learners do with accents in the two generic conditions, Type Denoting (TD) and Kind (the former similar to Polish; the latter to English). These are properties where the native judgments and the complexity of the morphological exponents may play a crucial role. The reader is reminded that these two constructions are just a subset of all generic meanings and their exponents. Although generic meanings are universal and all languages express them in some way or another, Norwegian uses *five* different functional morphemes as exponents of genericity. Thus, the Norwegian genericity paradigm is more complex than the English one with four possible exponents. In addition, as we see in the TD condition, some generic meanings can be rendered by two (or more) functional morphemes. In a recent study of Norwegian genericity marking (Velnić et al., 2025), the bare singular object as in (3b) *Det er viktig å ha vannflaske* 'It is important to have water bottle' was seen to be highly accepted with a TD reading,

but so was the indefinite singular object as in (3c) *Det er viktig å ha* ***en*** *vannflaske* 'It is important to have a water bottle'. This entails that learners of Norwegian would presumably encounter both exponents in the Norwegian input. Unexpectedly, instructed learners showed a significant negative effect when evaluating sentences like (3c) spoken with an English accent, as compared to the Norwegian accent.

In Kind generics, the exponents are overt definite articles in Norwegian and English. Indeed, the native speaker ratings confirmed that the definite article in (6b), *Elefant****en*** *er utrydningstruet* 'The elephant is endangered' is more acceptable than the Polish-like bare noun in (6c), *Elefant er utrydningstruet*, 'Elephant is endangered', even though the range of acceptability was quite wide. English-accented Norwegian sentences were assigned a lower rating than Norwegian-accented sentences in the Kind grammatical condition by the instructed learners, an unexpected result. However, here the morphological shape of the genericity exponents may provide an explanation. As shown above, the Norwegian definite article is expressed as a suffix on the noun, while the English definite article is a free morpheme before the noun. We suggest that this morphological distinction could provide a clue. That is, the English accent could be activating a morpheme in the wrong position for the Norwegian target. This suggests that the many-to-many form–meaning mapping likely causes additional processing issues. In addition, we observe that these conditions were not ideal to test our hypothesis, as genericity is complex on various levels: the morphological exponents of genericity are polysemous, the genericity marking paradigm is so large, and native judgments surprisingly often accept what we considered to be 'unacceptable' items.

We now turn to discussing how the L3 learners fared with the two baseline conditions where neither of the previously acquired languages could help them, Abstracts and Object Shift. In the former condition, both English and Polish use bare nouns while Norwegian has a definite article. This is another condition in which the native speakers make a near-categorical distinction. The learners, on the other hand, do not. They accept both the acceptable and the unacceptable variants. This tentative performance could be due to the negative structural effect of both the L1 and the L2. We do not see much evidence of an accent effect here. On the other hand, both the acceptable and unacceptable items in the Object Shift condition were deemed possible by the native speakers (Figure 1). Hence it is no surprise that the learners offered similar judgments. This means that the learners' behaviour in these conditions is different from their behaviour on Definiteness, for example, just as predicted.

We acknowledge that our data set is complex and not straightforward to interpret. In part this is so because the influence of accent that we sought to demonstrate is only subtle and works in consort with other variables. In an endeavour to cast a wide net, we tested eight different constructions where the Norwegian native judgments turned out to be not uniformly categorical, which is in line with preliminary results from other studies on the same groups (Castle et al., 2025, march). We saw diverse and largely positive evaluations where the Norwegian input did not afford the learners one-to-one mappings between form and meaning. We also attested some indications that both previously acquired languages could influence acceptability judgments through activation. This was true only for the conditions where the structurally unacceptable test items were boosted by accent. In other words, accent effects were not seen across the board.

The original expectation was that the performance of immersive learners would differ from the instructed learners of Norwegian and align more with native Norwegian controls based on the assumption that immersive learners receive more target-like input, which makes them more sensitive to Norwegian grammatical patterns. We found little support for this assumption with a slight tendency in the opposite direction; with instructed learners approximating more the categorical distinctions between grammatical and ungrammatical sentences made by the native raters, however, it was only attested in some conditions (i.e. Possessives, Professions and Ditransitives). This tendency may be more in line with an alternative explanation that the instructed L3 learners, who are university students of linguistics trained in language analysis, have an increased awareness of Norwegian grammar. Consequently, they may be more inclined to make more categorical grammaticality judgments, thus aligning more closely with native speakers than immersive learners, however, this interesting observation remains fairly tentative at present and it requires further research.

How do our findings square with current accounts of L3A? In the recent literature, activation of both previously acquired languages is widely accepted as the mechanism through which CLI is manifested. Three accounts that agree on this point are the Linguistic Proximity Model (Westergaard, 2021a) and the Scalpel Model (Slabakova, 2017) and the Natural Growth Theory of Acquisition (Dziubalska-Kołaczyk & Wrembel, 2024). While it is acknowledged that language activation depends on a multitude of factors, there is scarce research that tries to tease apart the contribution of various factors. In placing accent at the centre of our investigation and investigating cross-linguistic structural differences, our study contributes to this research agenda. In addition, our design with eight different syntactic constructions allowed us to establish that a number of other factors might be at play: variability in native baselines, the (lack of) one-to-one mapping between form and meaning, the position of the morphological marker, frequency and complexity of individual morphosyntactic properties, as well as the participants' L2 and L3 proficiency. All these variables clearly deserve experimental attention and should be investigated in separate research designs in the future.

Conclusions

In this study we have investigated the interaction of phonology and syntax, focusing on how a foreign accent may affect acceptability judgements of various morphosyntactic properties in an L3. More specifically, we have studied the acceptability of eight different constructions in Norwegian spoken with three different accents: A native Norwegian accent, a Polish accent, and an English accent. The participants are L3 learners of Norwegian, with Polish and English as their previously acquired languages. So far, most studies on L3 acquisition have focused on either morphosyntax or phonology. Our findings in the current study indicate that both previously acquired languages may influence acceptability judgements through what we interpret as accent-based activation of syntax, that is, a Polish accent activates the Polish grammar more than the English grammar, while an English accent has the opposite effect, activating the English grammar more. Further research is clearly warranted, and results may have both theoretical and practical/pedagogical implications. Among others, language

learners should be made aware that the perception of errors in speech production may be influenced by a foreign accent and further modulated by its type in relation to the languages in the learners' repertoire. Potential pedagogical implications may be related to the necessity to provide high variability phonetic training, to expose learners to a variety of input, including foreign-accented speech samples, in order to facilitate phonetic cue-based syntactic processing and learning, especially from a multilingual perspective.

Note

1. https://osf.io/d9wf3/?view_only=946f6fe745864c29b0e56b2a3bb79ff4

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Appendix. *emmeans* pairwise comparisons – L1 Polish speakers (naturalistic and instructed) and accentedness

Contrast	Estimate	SE	df	*z*.ratio	*p*.value
CG = Abstractsno, group = Instructed:					
ENG–NOR	−0.79077	0.390	Inf	−2.028	0.1055
ENG–POL	−0.27645	0.387	Inf	−0.715	0.7547
NOR–POL	0.51433	0.395	Inf	1.302	0.3939
CG = Abstractsyes, group = Instructed:					
ENG–NOR	0.37180	0.406	Inf	0.917	0.6297
ENG–POL	0.87163	0.402	Inf	2.167	0.0770
NOR–POL	0.49984	0.395	Inf	1.266	0.4145
CG = Definitenessno, group = Instructed:					
ENG–NOR	−0.23276	0.405	Inf	−0.575	0.8336
ENG–POL	−0.47872	0.402	Inf	−1.190	0.4590
NOR–POL	−0.24596	0.396	Inf	−0.621	0.8086
CG = Definitenessyes, group = Instructed:					
ENG–NOR	0.21267	0.405	Inf	0.525	0.8592
ENG–POL	−0.38883	0.413	Inf	−0.942	0.6135
NOR–POL	−0.60150	0.413	Inf	−1.456	0.3125
CG = Ditransitiveno, group = Instructed:					
ENG–NOR	−0.18198	0.318	Inf	−0.573	0.8345
ENG–POL	−0.28613	0.316	Inf	−0.906	0.6362
NOR–POL	−0.10415	0.316	Inf	−0.329	0.9420
CG = Ditransitiveyes, group = Instructed:					
ENG–NOR	−0.39336	0.317	Inf	−1.241	0.4290
ENG–POL	−0.67406	0.323	Inf	−2.085	0.0930
NOR–POL	−0.28070	0.331	Inf	−0.848	0.6732

(*Continued*)

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Contrast	Estimate	SE	df	*z*.ratio	*p*.value
CG = Kindno, group = Instructed:					
ENG–NOR	−0.70143	0.389	Inf	−1.804	0.1681
ENG–POL	−0.18809	0.387	Inf	−0.486	0.8778
NOR–POL	0.51334	0.393	Inf	1.306	0.3918
CG = Kindyes, group = Instructed:					
ENG–NOR	−1.10134	0.394	Inf	−2.794	0.0144
ENG–POL	−0.39821	0.390	Inf	−1.021	0.5636
NOR–POL	0.70314	0.391	Inf	1.799	0.1699
CG = Object_shiftno, group = Instructed:					
ENG–NOR	−0.51007	0.319	Inf	−1.597	0.2467
ENG–POL	−0.13514	0.318	Inf	−0.424	0.9055
NOR–POL	0.37493	0.324	Inf	1.158	0.4786
CG = Object_shiftyes, group = Instructed:					
ENG–NOR	−0.49609	0.320	Inf	−1.549	0.2683
ENG–POL	0.20768	0.316	Inf	0.657	0.7886
NOR–POL	0.70377	0.321	Inf	2.194	0.0722[A12]
CG = Possessiveno, group = Instructed:					
ENG–NOR	0.41132	0.329	Inf	1.250	0.4235
ENG–POL	0.28689	0.329	Inf	0.871	0.6585
NOR–POL	−0.12444	0.330	Inf	−0.377	0.9245
CG = Possessiveyes, group = Instructed:					
ENG–NOR	−0.38412	0.327	Inf	−1.175	0.4679
ENG–POL	−0.45535	0.324	Inf	−1.407	0.3372
NOR–POL	−0.07123	0.329	Inf	−0.217	0.9744
CG = Professionsno, group = Instructed:					
ENG–NOR	0.08494	0.407	Inf	0.209	0.9763
ENG–POL	−0.34551	0.400	Inf	−0.865	0.6626
NOR–POL	−0.43045	0.406	Inf	−1.060	0.5393
CG = Professionsyes, group = Instructed:					
ENG–NOR	0.00406	0.431	Inf	0.009	1.0000
ENG–POL	0.20753	0.434	Inf	0.478	0.8818
NOR–POL	0.20347	0.432	Inf	0.470	0.8852
CG = TD-genericno, group = Instructed:					
ENG–NOR	−1.07274	0.409	Inf	−2.625	0.0236
ENG–POL	−0.24135	0.393	Inf	−0.614	0.8127
NOR–POL	0.83139	0.411	Inf	2.020	0.1073
CG = TD-genericyes, group = Instructed:					
ENG–NOR	−0.42288	0.396	Inf	−1.068	0.5343
ENG–POL	0.25441	0.391	Inf	0.650	0.7921
NOR–POL	0.67729	0.387	Inf	1.748	0.1874
CG = Abstractsno, group = Naturalistic:					
ENG–NOR	0.14555	0.454	Inf	0.320	0.9450
ENG–POL	0.27007	0.457	Inf	0.590	0.8253
NOR–POL	0.12451	0.461	Inf	0.270	0.9605
CG = Abstractsyes, group = Naturalistic:					
ENG–NOR	−0.11882	0.482	Inf	−0.247	0.9670
ENG–POL	−0.06384	0.480	Inf	−0.133	0.9903
NOR–POL	0.05498	0.476	Inf	0.116	0.9927
CG = Definitenessno, group = Naturalistic:					
ENG–NOR	−1.07672	0.449	Inf	−2.400	0.0433
ENG–POL	−1.36158	0.453	Inf	−3.006	0.0075
NOR–POL	−0.28486	0.451	Inf	−0.632	0.8026

(*Continued*)

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Contrast	Estimate	SE	df	*z*.ratio	*p*.value
CG = Definitenessyes, group = Naturalistic:					
ENG–NOR	−0.22993	0.487	Inf	−0.472	0.8843
ENG–POL	0.55056	0.479	Inf	1.149	0.4839
NOR–POL	0.78050	0.495	Inf	1.576	0.2561
CG = Ditransitiveno, group = Naturalistic:					
ENG–NOR	−0.33125	0.370	Inf	−0.895	0.6434
ENG–POL	−0.30397	0.373	Inf	−0.815	0.6937
NOR–POL	0.02728	0.368	Inf	0.074	0.9970
CG = Ditransitiveyes, group = Naturalistic:					
ENG–NOR	−0.36539	0.371	Inf	−0.986	0.5860
ENG–POL	−0.06596	0.374	Inf	−0.176	0.9830
NOR–POL	0.29943	0.378	Inf	0.792	0.7082
CG = Kindno, group = Naturalistic:					
ENG–NOR	−0.85075	0.462	Inf	−1.842	0.1560
ENG–POL	−0.01993	0.447	Inf	−0.045	0.9989
NOR–POL	0.83082	0.458	Inf	1.813	0.1652
CG = Kindyes, group = Naturalistic:					
ENG–NOR	−1.05571	0.454	Inf	−2.327	0.0522
ENG–POL	−0.55669	0.448	Inf	−1.244	0.4273
NOR–POL	0.49902	0.450	Inf	1.109	0.5086
CG = Object_shiftno, group = Naturalistic:					
ENG–NOR	−0.37395	0.357	Inf	−1.046	0.5476
ENG–POL	0.01004	0.364	Inf	0.028	0.9996
NOR–POL	0.38399	0.362	Inf	1.060	0.5392
CG = Object_shiftyes, group = Naturalistic:					
ENG–NOR	−0.37919	0.371	Inf	−1.023	0.5623
ENG–POL	0.32695	0.360	Inf	0.909	0.6345
NOR–POL	0.70614	0.363	Inf	1.947	0.1257
CG = Possessiveno, group = Naturalistic:					
ENG–NOR	−0.43393	0.368	Inf	−1.179	0.4656
ENG–POL	−0.46952	0.365	Inf	−1.287	0.4026
NOR–POL	−0.03558	0.369	Inf	−0.097	0.9949
CG = Possessiveyes, group = Naturalistic:					
ENG–NOR	0.41007	0.391	Inf	1.050	0.5456
ENG–POL	0.68699	0.387	Inf	1.774	0.1782
NOR–POL	0.27691	0.373	Inf	0.742	0.7383
CG = Professionsno, group = Naturalistic:					
ENG–NOR	−0.14458	0.463	Inf	−0.312	0.9477
ENG–POL	−0.16222	0.461	Inf	−0.352	0.9341
NOR–POL	−0.01763	0.463	Inf	−0.038	0.9992
CG = Professionsyes, group = Naturalistic:					
ENG–NOR	−0.42802	0.497	Inf	−0.861	0.6648
ENG–POL	0.67948	0.478	Inf	1.421	0.3302
NOR–POL	1.10750	0.484	Inf	2.286	0.0577
CG = TD-genericno, group = Naturalistic:					
ENG–NOR	−0.64124	0.473	Inf	−1.355	0.3648
ENG–POL	0.43450	0.454	Inf	0.958	0.6035
NOR–POL	1.07574	0.472	Inf	2.278	0.0589
CG = TD-genericyes, group = Naturalistic:					
ENG–NOR	−0.77102	0.462	Inf	−1.670	0.2169
ENG–POL	0.01224	0.458	Inf	0.027	0.9996
NOR–POL	0.78326	0.455	Inf	1.723	0.1965

P value adjustment: Tukey method for comparing a family of three estimates