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Sociolinguistic competence and varietal repertoires in a second language: A study on addressee-dependent varietal behavior using virtual reality

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Abstract

The present study takes a variationist perspective to explore the varietal repertoires of adult learners of German as a second language (L2), that is, their variable use of standard German, Austro-Bavarian dialect, and mixture varieties. Forty L2 learners completed a virtual reality task involving interactions with dialect-speaking and standard-German-speaking interlocutors. Using Bayesian multilevel modeling, the goal was to explore differential outcomes in the acquisition of sociolinguistic competence by determining whether participants adjusted their varietal behavior to match that of the interlocutor (i.e., varietal convergence). The results show that there were no interindividual addressee-dependent convergence tendencies. A holistic person-centered analysis of individual learners' intraspeaker variation revealed that only select L2 learners adjusted their usage patterns but did not entirely invert their usage of dialect and standard language as a function of the variety of the interlocutor. Introspective qualitative data speak to potential drivers behind the differential development of L2 (multi)varietal repertoires.

KEYWORDS

acquisition of variation, Bayesian modeling, sociolinguistic competence, varietal repertoires, virtual reality

A major challenge in navigating everyday life in Austria as a second language (L2) learner is the coexistence of entire sociolinguistically functional varieties such as standard German and Austro-Bavarian dialect. A speaker who produces "Gemma hoam"—that is, the dialectal realization of standard German "Gehen wir heim [let's go home]"—may be perceived as more likeable, friendly, or even humorous in characteristically informal settings, but potentially less educated and competent in situations in which a high degree of formality is foregrounded (e.g., Bellamy, 2012; Soukup, 2009). Contrariwise, producing exclusively standard German in informal interactions may sound excessively formal. This (in)ability to adjust one's varietal behavior (e.g., based on the situation and interlocutor) is strongly tied to speakers' identity development and to issues of group affiliation. In second language acquisition (SLA) research, an aspect that has garnered considerable attention is thus the process by which learners acquire sociolinguistic competence, that is, the ability to understand and produce variable L2 patterns in contextually sensitive ways (for recent overviews, see also Geeslin, 2018; Geeslin & Long, 2014; Kanwit & Solon, 2023). Research on SLA of variable linguistic features can be divided into two investigative strands. On the one hand, developmental variation in learner speech with a distinction between target-like and non-target-like forms has been referred to as Type I variation (Rehner, 2002). On the other hand, the acquisition of structures and forms that are variable in the target language community (e.g., socially motivated intraspeaker variation) is referred to as Type II variation. The latter, learners' acquisition of sociolinguistic competence, informs the current study.

At this point, it can be taken as an axiom that the acquisition of sociolinguistic competence is an individually owned process (Ender, 2022; Howard, 2012; Kinginger, 2008; Regan, 2010; van Compernolle, 2019; van Compernolle & Williams, 2012; Wirtz & Pfenninger, 2023b, 2024). In the Austrian context, initial results point to the substantial interindividual role of (psycho)social alongside exposure- and proficiency-related factors in the acquisition of varietal resources. For example, higher proficiency in and exposure to dialect varieties is associated with more variable sociolinguistic repertoires (Wirtz & Pfenninger, 2023a), and migrants in occupations requiring more manual handling and physical precision work are predicted to employ dialect varieties more often (Wirtz, 2024). That said, questions concerning which types of varietal repertoires L2 learners of German in Austria wield, how large the spectrum of individuality in learners' use of varieties is, and especially why migrants agentively pursue the acquisition of nonstandard, sociolinguistically functional varieties remain unanswered.

To tackle the aforementioned research lacuna, the present study analyzes data from 40 adult migrants with L2 German living in Bavarian-speaking Austria. Informed by the growing body of variationist sociolinguistic research on varieties of German (e.g., Beaman, 2020, 2021; Bülow & Vergeiner, 2021; Ender & Kaiser, 2009, 2010; Stratton, 2020, 2022; Vergeiner, 2020; Wirtz, 2022), we explore by way of Bayesian multinomial modeling and qualitative analysis whether and why migrants with L2 German acquire sociolinguistic resources that are typical of first language (L1) speakers—specifically, varietal convergence to the (non)standard variety of the interlocutor. Thematically, this facilitates first insights concerning how L2 learners deal with sociolinguistic variation in their immediate input in the noninstructed context, that is, whether they retain strictly standard German speech classically taught in the classroom context or whether they integrate nonstandard speech into their repertoires as a means of accommodating to the community around them. Methodologically, this study paves new ground by employing a virtual reality (VR) experiment to elicit learners' varietal behavior. While live semidirected or sociolinguistic interviews have been a dominant methodology in both traditional variationist sociolinguistic studies (e.g., Labov, 1966) and variationist studies of SLA (e.g., Kanwit, 2022), they have come under some criticism (e.g., power asymmetries). VR presents a novel way to address many of these shortcomings, especially because of its unprecedented ability to reconcile ecological validity and experimental control (e.g., Peeters, 2019). Taken together, the thematic and methodological issues addressed here position this study to be useful in terms of both pedagogy and methodological innovation in variationist-informed research approaches. Concerning the former, our results advance our understanding of the extent to which L2 learners can acquire sociolinguistic resources in the noninstructed context—a pertinent question especially in light of the

unimpressive amount of pedagogical material targeting the structured acquisition of sociolinguistic competence in Austria (e.g., Ruck, 2017; Wuensch & Bolter, 2020). With respect to the latter, the VR methods—alongside the quantitative advances such as Bayesian multilevel modeling—should be of interest to both variationist sociolinguists and SLA scholars as a unique way to ensure socially, spatiotemporally, and contextually comparable data across participants without jeopardizing the dynamics and multimodal richness of everyday communicative interactions.

THE BAVARIAN–AUSTRIAN SOCIOLINGUISTIC SETTING

Austria is a German-speaking country whose pattern of standard German and dialect use has been conceptualized as a dialect–standard continuum, implying that there is no "clear-cut distinction between two varieties in use but that a range of speech forms 'in-between' is composed of variable proportions of standard and dialect forms" (Kaiser, 2022, p. 45). These language varieties coexist in everyday life. Austro-Bavarian dialect[1] varieties are characterized by their regional use and areal association and are often considered "an intimate form of language" spoken "in intimate circles among acquaintances and persons of perceived equal rank" (Wiesinger, 1990, p. 222, our translation). For a (nonexhaustive) list of features of Austro-Bavarian dialects, see Kaiser (2022). Conversely, (Austrian) standard German is the prototypical language of instruction as well as the language of official and public addresses and discussions on various occasions; moreover, it is used when the conversation partner is a stranger or regionally unfamiliar and/or socially higher-ranking (Steinegger, 1998). The standard German variety is also used when it is assumed that the interlocutor cannot understand the local variety, for example, with L2 speakers or speakers from other German-speaking countries (Ender & Kaiser, 2009). Importantly, social factors have also been shown to influence linguistic choices across varieties of German, such as gender (e.g., Stratton, 2020, 2022), age (e.g., Ziegler et al., 2021), education (e.g., Beaman, 2020, 2021), and identity and social network (e.g., Beaman, 2020; Lippi-Green, 1989), though the effects of these factors can differ between dialect regions.

In Ender and Kaiser's (2009) survey, 72% of Austrians from the Bavarian-speaking parts reported having good or fairly good proficiency in both standard German and dialect. That said, speakers' situational use of varieties is typically a function of, for example, the formality of the situation and addressee-dependent factors, such as the variety used by the interlocutor. Importantly, in interactions between sociolinguistically competent speakers in Bavarian-speaking Austria, processes of accommodation are common (Wirtz, 2022). For example, when interacting with standard German speakers, a shift away from speakers' preferred dialect variety toward mixture and/or standard German varieties can be expected (Ender & Kaiser, 2009). Whether and the extent to which L2 learners in the Austro-Bavarian naturalistic sphere engage in similar sociolinguistic practices, however, remains unanswered.

VARIETAL CONVERGENCE: ALIGNING TO L1 SPEAKERS AND VARIATION IN THE INPUT

For L2 learners, specifically for migrants who have built or are currently building a life in the target language community, conveying basic needs in the L2 is often not enough. If they wish to "'converge' or 'blend in' with the host community" (Regan, 2010, p. 24), then it is necessary to acquire sociolinguistic competence, that is, "the knowledge of how and when to speak, to whom, how to shift style, register and so on" (Regan, 2010, p. 22). In Bavarian-speaking Austria, this includes knowledge of L1 speakers' tendency to differentially use standard German and dialect varieties as a function of the interlocutor's choice of variety (see, e.g., Ender & Kaiser, 2009, 2010; Vergeiner, 2020; Wirtz, 2022).[2] Such varietal convergence patterns appear prevalent in commonplace interaction in Bavarian-speaking Austria, and so it stands to reason that L2 learners are subject to such patterns of variation in their everyday input. This notion was a guiding pillar in our operational choice of sociolinguistic

competence: We argue that varietal convergence meets the multidimensional measurement demands of sociolinguistic competence because it requires speakers to (a) observe and replicate "the details of the variability present in the native speaker system" (Regan, 1996, p. 178) as a means to subsequently (b) make variable use of sociolinguistic variants (Dewaele, 2002) or entire language varieties (Ender, 2022), which can in turn be used to measure speakers' ability to (c) "style-shift consistently and appropriately" (Dewaele, 2004a, p. 432). On a more methodological note, using varietal convergence as a measure of sociolinguistic competence may be considered advantageous over assessing sociolinguistic competence on the basis of frequency-based measurements of singled-out sociolinguistic variants. This is because varietal convergence offers a broader, more global measure, in that it can also comprise sociolinguistic features of phonological, morphosyntactic, and lexical nature (for extended discussions of convergence as an operational measure of sociolinguistic competence, see Ender, 2021, 2022; Wirtz, 2022).

With a particular eye on L2 learners, Regan (2010) argued that L2 learners in naturalistic contexts construct their own L2 identity and so position themselves in the target language community by adopting (or even adapting) common patterns of language variation. For example, Dewaele's (2004a) analysis of "ne" deletion by L2 learners of French revealed that L2 speakers omitted the "ne" more frequently in interactions with L1 than with other L2 speakers, likely as a way to maximally converge to L1 speakers' variation patterns. Interestingly, this convergence trend did not hold true across further sociolinguistic variables, such as L2 speakers' use of the informal address pronoun "tu" over the formal "vous" (Dewaele, 2004b). Learners' adherence to L1-like sociolinguistic patterns in some cases but not in others may be a result of cognitive effort, degree of risk involved in the variable use of the sociolinguistic variable, or simply the internalization of language input in direct interaction with a respective L2 speaker (Dewaele, 2004a), among other factors. In any case, these inconsistencies in convergence to L1-like variation patterns across sociolinguistic variables underscore the need for more global sociolinguistic competence measurement practices, such as aggregated convergence scores across phonological, morphosyntactic, and even lexical sociolinguistic variables. This is where the rich language variation comprising functionally variable language varieties in the German-speaking world—particularly in the Swiss–Alemannic and Austro-Bavarian contexts—can propel our knowledge of L2 acquisition of sociolinguistic competence forward. To this end, Ender (2022) investigated learners' (L2 German) use of Swiss and standard German varieties in the Swiss–Alemannic context, and whether they adjusted their varietal use to match the variety of the standard-German-speaking and dialect-speaking interlocutor. Of her 20 participants, 15 speakers showed a comparatively invariable preference for the standard variety (5 users), the local dialect (2 users), or mixed speech (8 users). As concerns adaptive varietal behavior, only five participants shifted varieties in an interlocutor-dependent way, two of whom overall preferred the standard language, two the dialect variety, and one of whom mixed both varieties extensively. Importantly, these five participants did not entirely invert their usage patterns, but rather increasingly drew on the variety used by the respective standard-German- or Swiss-dialect-speaking interlocutor, so shifting their frequency profiles of standard German, Swiss dialect, and mixed speech. With these variation patterns in mind, Ender (2017, 2021) noted the driving role of learners' social experiences, their expectations toward the surrounding community, and their target place within it in shaping how L2 learners of German integrate standard and local varieties into their own varietal repertoires.

METHODOLOGICAL APPROACHES AND INNOVATIONS

The overwhelming majority of variationist-informed studies have employed sociolinguistic interviews in the Labovian tradition as a means to capture stylistic variation (e.g., Labov, 1966, 1972). In variationist SLA, such a method represented a "reasonable starting point" (Geeslin, 2010, p. 514), despite coming under some criticism: inherent power asymmetries, being potentially less natural for informal speech collection, different interactional situations across participants, unintentional interviewer

accommodation, to name a few (see de Fina & Perrino, 2011; Milroy & Gordon, 2003; Schilling-Estes, 2008; Wirtz, 2022; Wolfson, 1976). Variationists have methodologically responded to such critiques, one example being the modification of the dynamics of the interview situation to facilitate a more natural and consistent environment (e.g., placing pairs of speakers in a room and allowing for free conversation, group interviews, interviews in friendship pairs; see Milroy & Gordon, 2003). While these methodological adaptions have certainly made great strides in the right direction, they cannot escape falling victim to human-related confounding effects that are near impossible to control for in any live oral interview setting, for example, different interactional situations across participants as a result of interlocutor or interviewer idiosyncrasy, unintentional interviewer accommodation, and so on (Milroy & Gordon, 2003; Schilling-Estes, 2008). This is where immersive VR takes center stage.

VR involves a head-mounted display that immerses users in a three-dimensional, context-rich virtual environment which can simulate real-life experiences by replacing the cues of the real-world environment with digital ones (Fox et al., 2018). As an experimental method, VR has been positioned as an instrument with the unique potential to reconcile the experimental control of psycholinguistic designs and the ecological validity of interviews and conversation analysis (e.g., Peeters, 2019; Taguchi, 2021, 2022; Vanrell et al., 2018). Indeed, VR has been shown to afford a highly immersive, interactive, and emotionally engaging environment. For example, Taguchi (2021) found, in her sample of L2 learners, that VR users experience strong affective states that are comparable to affective experiences in the real world. Wirtz (2022) noted, in his sample of L1 speakers, that participants "appear to have experienced an immersive, informal, and friendly environment that reflects/simulates a natural conversation" (p. 7) in the VR environment. These results empirically underscore the high ecological validity of VR. When combined with high experimental control on the part of the researcher, VR can facilitate the experimental study of human behavior in settings that acknowledge the multimodal dynamics of everyday communication. Capitalizing on the advantages of VR when interested in L2 learners' variable use of language specifically has the following (nonexhaustive list of) benefits:

1. Each participant can be provided with the same explicit and/or audiovisual social–situational contextualizing information, which serves to reduce possible power and/or social asymmetries characteristic of live interview situations.
2. The spontaneous speech data elicited are comparable across participants.
3. The (audio)visual setting can be actively tailored to mimic different social–situational settings (e.g., the VR can be set in a coffee house, bus stop, apartment, and so on).
4. A relatively large amount of spontaneous speech data can be collected in a comparatively short amount of time.
5. Virtual agents outperform their live interview confederates with respect to behavioral consistency and replicability.

In sum, there is a clear and urgent need in variationist sociolinguistic and SLA approaches to develop methods and operational measures more suitable for capturing stylistic variation. As we have discussed, the few studies to date in variationist SLA operationalizing sociolinguistic competence in terms of convergence effects have relied on a few select sociolinguistic variables, such as "ne" deletion or use of address pronouns in L2 French (e.g., Dewaele, 2004a, 2004b). Transcending the use of select sociolinguistic variables, Ender (2022) took advantage of the Swiss–Alemannic context by operationalizing sociolinguistic competence as learners' ability to adjust their use of Swiss dialect and standard German in relation to the interlocutor's variety. However, when interested in convergence effects as an operational measure of sociolinguistic competence, it becomes crucial to control for human-inherent confounders such as unintentional interviewer accommodation to the interviewee. This is essential in order to ensure stable between-participant comparisons. The present study adopts Ender's novel operationalization of sociolinguistic competence for the Austro-Bavarian context and expands on the method by employing immersive VR technology as a means to maximally exclude the confounding effects characteristic of live oral interviews. In so doing, we have full control over the

visual, auditory, spatiotemporal, and social input participants receive (i.e., experimental control), and the immersive virtual space provides a context-rich and communicative environment that mimics the dynamics of everyday communication, and so stands as a suitable substitute for the more traditional oral semidirected or sociolinguistic interview.

THE PRESENT STUDY

The current study is part of a broader project that aims to explore the role of linguistic, socioaffective, and cognitive factors in sociolinguistic development by adult L2 learners of German. Importantly, this article is to be considered in conjunction with the analyses of the same learners and dataset presented in Wirtz and Pfenninger (2023a), in which the goal was to explore (a) the relationship between quantitatively captured individual difference factors and differential outcomes in varietal behavior, and (b) the (dis)continuity therein—that is, when do learners interindividually acquire the ability to engage with sociolinguistic variation (see also Wirtz & Pfenninger, 2024). In what follows, we attempt to elucidate (a) which learners stand out against interindividual trends, (b) which types of varietal repertoires migrants have at their disposal, and (c) how qualitative data can shed more detailed light on why differential L2 sociolinguistic, multivarietal repertoires emerge.

The present study contributes to several outstanding research lacuna and ongoing discussions in variationist SLA: To begin, we do justice to myriad calls to action to (a) "investigat[e] additional language pairings" (Kanwit, 2022, p. 40), and (b) explore "other instructed and noninstructed learning contexts" (Long, 2022, p. 429). By focusing the contextual lens on noninstructed learning in the naturalistic setting of Bavarian-speaking Austria, we address a comparatively understudied language pairing (English–[Austrian] German) in a long-neglected geographical area of research in variationist SLA. Critically, we also heed Geeslin's (2010) words to "expand methodologically beyond what currently exists" (p. 514) by employing immersive VR tasks. Finally, this contribution makes important strides to bridge quantitative and qualitative analyses, adopting not only complex Bayesian multilevel analyses, but also holistic person-centered approaches, the goal being to carefully provide "analyses of individual learners (…) in addition to group aggregates" (Kanwit, 2022, p. 39; see also, e.g., Larsen-Freeman & Cameron, 2008). The driver behind meaningful triangulation of person and group is because, in the words of Regan (2013), "humans are complex and we cannot explain what they do by reference to broad social and linguistic generalisations" (p. 45); rather, we must allow for and encourage exploring the "individual variation explained by their individual stories" (p. 45; see also Ender et al., 2023; Kanwit, 2017, 2019; Wirtz & Pfenninger, 2023b). To this end, the present study is guided by the following exploratory research questions:

RQ1. To what extent do adult L2 learners of German in Austria interindividually adjust their varietal behavior toward the respective variety of the dialect-speaking and standard-German-speaking virtual interlocutor?
RQ2. How is L2 learners' intraspeaker variation in interaction with the dialect-speaking and standard-German-speaking virtual interlocutor characterized (e.g., how do learners adjust their frequency profiles of standard German, dialect, and mixture varieties)?
RQ3. How do learners explain differential outcomes in their L2 (multi)varietal repertoires in terms of socioaffective, experiential, and contextual variables (e.g., L2 life experiences, past and present relationships with the L2 environment)?

These RQs invite quantitative and qualitative perspectives on the acquisition of sociolinguistic competence. RQ1 focuses on group-level effects and general patterns drawn from mean L2 performance. Conversely, RQ2 scrutinizes the individuals against the backdrop of the group, while RQ3 contextualizes the findings by considering carefully curated ethnographic detail to better provide "complementary 'layers' of individual lives" and "explanation[s] for the anomalies" (Regan, 2013,

p. 45; see also Kanwit, 2017). It is hoped that the meaningful integration of these analyses can generate a more wholesome picture concerning the acquisition of sociolinguistic competence in L2 German, not only in terms of whether participants adjust their varietal behavior in function of the interlocutor, but, more importantly, which participants stand out against the group and why.

METHOD

All experimental materials are available on IRIS, and all quantitative analyses conducted in R and qualitative coding procedures, as well as the experimental materials used (i.e., VR transcripts) can be found on this article's Open Science Framework (OSF) repository.[3]

Participants

This study included data from 40 participants (22 men, 17 women, 1 gender diverse) with German as an L2. Our sample comprises migrants who had moved to Austria for work, education, significant others, and so on. All participants identified as L1 speakers of English, and were born and/or grew up in English-speaking countries. Candidates were from the British Isles ($n = 12$), the United States ($n = 20$), New Zealand ($n = 2$), Canada ($n = 2$), South Africa ($n = 1$), and Australia ($n = 1$). Two candidates were born to English-speaking parents in Japan and Peru, respectively, but were raised predominately in the United States. Participants had not spent extended periods of time in the L2 environment preadulthood. Since participants were recruited via fliers and word of mouth, the present dataset can be characterized as a convenience sample, and sample size was determined on the basis of practical considerations (e.g., time, funding, and so on). Given the aforementioned reasons, and also in light of the specialized population under scrutiny here (i.e., L2 learners of German with L1 English), the sample could not be stratified by sociolinguistic factors such as gender or socioeconomic status, as is otherwise typical of variationist sociolinguistics work (e.g., Labov, 1990).

The sample pool comprised young and middle-aged adults ($M = 30.52$ years, $SD = 8.10$, range = 20–57). Participants differ in terms of length of residence in Austria ($M = 4.01$ years, $SD = 3.31$, range = 0–13.8). As measured via aggregated self-reported scores for reading, writing, listening, and speaking on 100-point slider scales, learners were moreover comparatively heterogeneous in their respective proficiency levels of standard German ($M = 59.98$, $SD = 21.17$, range = 16–100) and Austro-Bavarian dialect ($M = 24.12$, $SD = 21.11$, range = 0–78.75). For additional information regarding this participant pool (e.g., profession, length of German acquisition, and German coursework both in Austria and their homeland), we refer interested readers to the biodata file on OSF.[4]

Tasks and procedure

The tasks relevant to this contribution stem from a larger test battery, the data collection for which lasted approximately 1.5 hours in total. All tasks were completed in a quiet and undisturbed room at the participants' convenience. The experimental procedure in the present contribution consisted of a VR oral dialogue construction discourse completion task, which lasted approximately 15 minutes. In what follows, we briefly outline the VR configuration and the oral dialogue construction task procedure.

VR configuration

The VR configuration used in the present study consisted of a Shinecon (model: FIYAPOO) headset for smartphones. The smartphone was an iPhone 11 with a 6.06″ full HD screen, 4 GB RAM, and

a gyroscope sensor. The iPhone ran the software version 14.4.2 and used the pro-version VRPlayer app, which was configured with a special profile created for a headset–smartphone combination. The field of view was approximately 180 degrees with a refresh rate of 60 Hz. It is important to mention that, while previous VR studies have made use of more advanced hardware configurations, low-cost VR headsets for smartphones produce similar results in terms of user experience, for example (Amin et al., 2016; Papachristos et al., 2017). Given this, the low-cost configuration was chosen.

Virtual reality oral dialogue construction discourse completion task

The goal of this task was twofold: First, to measure learners' acquisition of sociolinguistic competence in the L2 and, second, to collect introspective qualitative data. Concerning the first aim, we wanted to assess learners' ability to adjust their varietal behavior toward the respective variety of the dialect-speaking and standard-German-speaking virtual interlocutor. To this end, participants were subjected to two sets of VR oral dialogue construction tasks: Each VR set contained an interaction with a woman standard-German-speaking interlocutor (24 years old) and woman Austrian dialect-speaking interlocutor (27 years old), both of whom were from Upper Austria.[5] The VR-based interactions included prerecorded videos with a field of vision of approximately 180 degrees, and participants saw and interacted with a real-life person in the VR rather than with an avatar. All VR tasks were informal in nature (VR set 1: running into a friend outside; VR set 2: meeting a friend for coffee in her apartment), as the goal was not to test learners' formality-dependent varietal behavior, but rather strictly their varietal convergence ability. Each VR set began with explicit contextual information read in English. This was done to (a) preclude chances of accidental accommodation to the instructions (which would have otherwise been provided in standard German), (b) ensure that participants clearly understood the social and situational contextual background, which served in part to (c) reduce risks of power asymmetries. During the tasks, an Austrian standard-German-speaking and dialect-speaking interlocutor asked the participant a series of conversational questions (see the next paragraph). Each interlocutor asked three questions per set (a total of six questions), and the participant only interacted with one interlocutor at a time (the respective other interlocutor was not shown on screen).

The second aim of this task was to function as a suitable replacement for the semistructured or sociolinguistic interview and thus to collect qualitative ethnographic information on participants, which is useful for gleaning introspective insights into learners' life histories, experiences, and relationships to the L2 community. The conversational questions that the VR interlocutors asked participants thus focused on, for example, when and where to use Austrian dialects, whether the participant spoke a dialect in their L1, if the participant was planning to stay in Austria, about problems in navigating dialects in Austria, and so on. Learners' responses to these questions posed in the VR interactions could then be analyzed both in terms of what they said (i.e., the qualitative analysis) and how they said it (i.e., a quantitative analysis of whether they accommodated to the interlocutor's variety)—a procedure that has also been used in previous variationist SLA work (e.g., Ender, 2015, 2022). It is important to highlight that the interlocutor's questions targeting participants' knowledge of Austro-Bavarian dialect may have affected their dialect use. To counteract this, questions concerning Austro-Bavarian dialect were only asked by the dialect-speaking interlocutor. Wirtz (2022) outlined the experimental piloting procedure to ensure the questions asked—and how they were asked—were as natural as possible.

Segmentation, transcription, and annotation

The speech data collected were first segmented into clausal units using ELAN (2021) in order to account for the syntactic structure of speech. Because dialect and standard German share a pool of features that cannot be unambiguously categorized as one or the other code, analyses at the clausal

level have been positioned as better apt at capturing the "combination of multiple elements that should be analyzed in conjunction to each other" (Ender, 2021, p. 261; see also Kaiser & Ender, 2021). Once the speech data had been segmented, they were manually transcribed quasi-orthographically with the aim of capturing any features that distinguished standard German, dialect, and mixture speech. Each clausal unit in the present corpus was then categorized following similar schemes as in Ender (2021, 2022) and Kaiser (2019, 2022; see Example 1).

EXAMPLE 1
Categorization schemes

a. *Ambiguous*, that is, possible in both standard German and dialect:

fi'laɪ̯çt ɪst ɛs eːɐ̯ fyːɐ̯ so͡tsi̯aːlə situa͡tsi̯oːnən
Maybe it is more so for social situations

b. *Standard German*, that is, clausal units comprising words with features consistent with standard German and/or the Austrian standard of usage (Kleiner & Knöbl, 2015) and ambiguous words:

'hɔɪ̯tə naχt hat ɛs fiːl gə'ʃnaɪ̯t
Last night it snowed a lot.

c. *Dialect*, that is, clausal units comprising words with Central Bavarian dialect features (see, e.g., Ender & Kaiser, 2009, Vergeiner, 2021) and ambiguous words:

'haɪ̯d nɔχd hɔːds fiː kʃniːm
Last night it snowed a lot.

d. *Mixture*, that is, clausal units comprising (a) both standard German and dialect words, or (b) words with both dialect-near and standard-near features:

(i) 'hɔɪ̯t nɔχt hɔts fiːl kʃnaɪ̯t
Last night it snowed a lot.
(ii) 'nɔχbaːɐ̯ [neighbor], that is, with unsystematic dialectal "a" darkening (vs. standard German 'naχbaːɐ̯ and dialectal 'nɔχbɔɐ̯)

Isolated word productions that, due to their stark deviation from a possible target-like form, could not be classified as one of the categories discussed above, or otherwise were not perceptually discernible in the recordings, were not taken into account during the categorization process and were not analyzed further. Clausal units comprising exclusively ambiguous word realizations were also excluded from further analysis.[6]

Data analyses

We conducted three primary analyses, all of which were highly exploratory in nature. To analyze participants' interindividual ability to adjust their varietal behavior toward the variety of the interlocutor, we fitted a Bayesian multinomial mixed-effects model (see, e.g., Gudmestad et al., 2013; Kanwit, 2017) with a logit linking function using the brms package (Bürkner, 2017) in R (R Core Team, 2020). Such regression models are used to predict categorical placement in—that is, the probability of—category membership of a given outcome variable based on a set of predictor variables. Standard German was entered as the reference level since participants were hypothesized to predominately

produce the standard German variety. VR interlocutor was treatment coded with dialect interlocutor as the reference level and entered as the sole fixed effect. On the whole, the model reports on whether the dialect and mixture varieties were used more or less often than standard German in response to the variety of the respective interlocutor.

By-participant and by-item random intercepts were introduced to account for potential participant-specific and item-level (i.e., potential differences between VR sets and conversational settings) idiosyncrasies. Models were fitted with weakly informative priors (see Appendix A). In accordance with the suggestions in Kruschke (2018), we established a region of practical equivalence (ROPE): "the range of parameter values that are equivalent to the null value for practical purposes" (p. 272). We defined the ROPE at $\pm$ 0.18 (in log-odds) around a point null value of 0. We report mean posterior point estimates for each parameter, the 95% highest density interval (HDI; basically, the Bayesian analog to the frequentist confidence interval), and the percent of the region of the HDI contained within the ROPE. We judge there to be compelling evidence for a given effect when 95% of the HDI of a posterior predictive distribution for a parameter β falls outside the ROPE. Following this, we visually inspected individual learners' intraspeaker variation. The goal here was to locate individual participants who engaged in forms of varietal shifting, that is, who make differential use of standard German, dialect, and mixture varieties in interaction with the standard- and dialect-speaking interlocutors.

After determining different types of multivarietal repertoires based on visual categorization of the observed intraspeaker variation patterns and a cluster analysis (see Appendix D), we zoomed in on how participants explained the differences in their varietal repertoires. To this end, the qualitative data were analyzed via the software MAXQDA (version 2022; https://www.maxqda.com). First, the data were deductively coded based on the thematic orientations of the questions posed during the VR task (e.g., well-being in Austria, relations to the L2 [dialectal] environment, self-perceptions of varietal acquisition and use).[7] Following this, we established subthemes within the overarching deductive codes by analyzing each participant statement individually and then examining the interactions between the subthemes to identify overarching patterns and relationships between themes. Categories were then established and recorded in a coding scheme, with a focus on potential drivers for differential outcomes in participants' multivarietal behavior (see Appendix B).

RESULTS

Interindividual varietal repertoires

Figure 1 visualizes the descriptive statistics of participants' relative varietal behavior in interaction with the VR dialect- and standard-German-speaking interlocutor (3282 clausal units in total; see Tables C1 and C2 in Appendix C for the numerical summary of the absolute and relative values). It becomes clear that learners did not interindividually adjust their varietal profiles to match the variety of the respective VR interlocutor. That said, there was a considerable amount of variance in these data. For example, the relative use of standard German in interaction with both interlocutors ranged between 6%−7% and 100%. This shows that, whereas select participants exclusively employed the standard German variety, others made little to no use of it, tending toward either dialect or mixture varieties. Interestingly, the distribution of the mixture variety was more continuously widespread than was the dialect variety, indicating that mixture varieties were used more readily than dialect ones.

A Bayesian mixed-effects multinomial model assessing potential addressee-dependent varietal behavior confirmed the descriptive statistics, in that there was no evidence of interlocutor-constrained varietal shifts at the interindividual level. As the negative intercepts in Table C3 in Appendix C show, learners were more likely to employ the standard German variety in interaction with the dialect-speaking interlocutor as opposed to the dialect and mixture varieties: dialect, Intercept = −4.87, HDI = [−6.72, −3.28], ROPE = 0%; mixture, Intercept = −3.13, HDI = [−4.29, −2.09], ROPE = 0%. Concerning addressee-dependent varietal shifts, the model indicated that participants were not more or

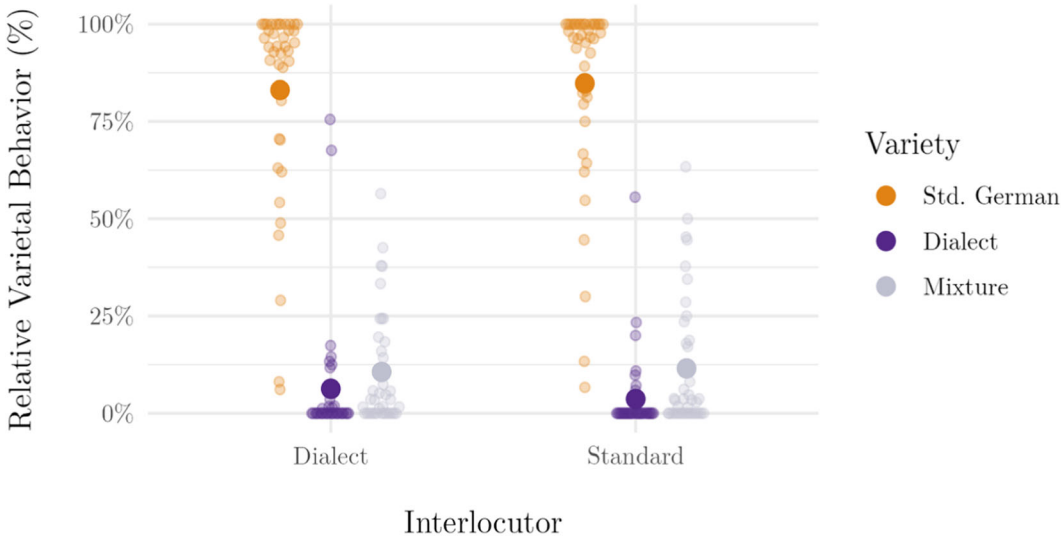

FIGURE 1 Relative varietal behavior in interaction with the virtual reality dialect- and standard-German-speaking interlocutor.
[Color figure can be viewed at wileyonlinelibrary.com]
Note. In this beeswarm plot, the semitransparent points indicate individual participants' varietal usage, and the solid points represent the mean varietal behavior.

less likely to produce dialect and mixture varieties in interaction with the standard-German-speaking interlocutor as compared to the dialect-speaking interlocutor: dialect, $\beta = -0.55$, HDI = [−2.05, 1.36], ROPE = 9.21%; mixture, $\beta = 0.03$, HDI = [−1.08, 1.10], ROPE = 55.95%. Interestingly, whereas over half of the posterior distribution fell into the ROPE with respect to the mixture variety coefficient, indicating insufficient evidence for the effect, the dialect variety coefficient was negative in directionality. That is, there was an indication that the dialect variety, at least among some participants, was used slightly less in interaction with the standard German interlocutor than with the dialect-speaking interlocutor, as Figure 2 shows. In any case, we again underscore the exceedingly high degree of uncertainty in the resultant model estimates, and the widespread probabilities therein.

On a final note, it is important to mention that, in a Bayesian framework, we focus not on point estimates, but rather on estimates of uncertainty. These can be more telling of the variability in the group than a singled-out nonsignificant point estimate characteristic of typical frequentist approaches. In light of the high uncertainty the Bayesian multilevel model generated—clearly visualized in the quantile dotplots in Figure 2—it stands that there is a nonnegligible degree of individuality contained in the dataset. This implores us to investigate individual learners, their patterns of behavior, how certain participants stand out against the backdrop of the group, and why. In what follows, we thus direct our attention to the individual participants and their differential intraspeaker varietal patterns, as this should aid in clearing up some of the uncertainty persistent at the interindividual level.

Addressee-dependent intraspeaker variation

As Figure 3 illustrates, a few participants stand out against the group-level estimates (i.e., the tendency toward standard language usage). While no participant entirely inverted their varietal behavior to match the variety spoken by the respective interlocutor, a few select learners did either (a) increase their use of the code employed by the interlocutor or otherwise (b) change their frequency profiles of dialect, standard, and mixed speech addressee dependently.

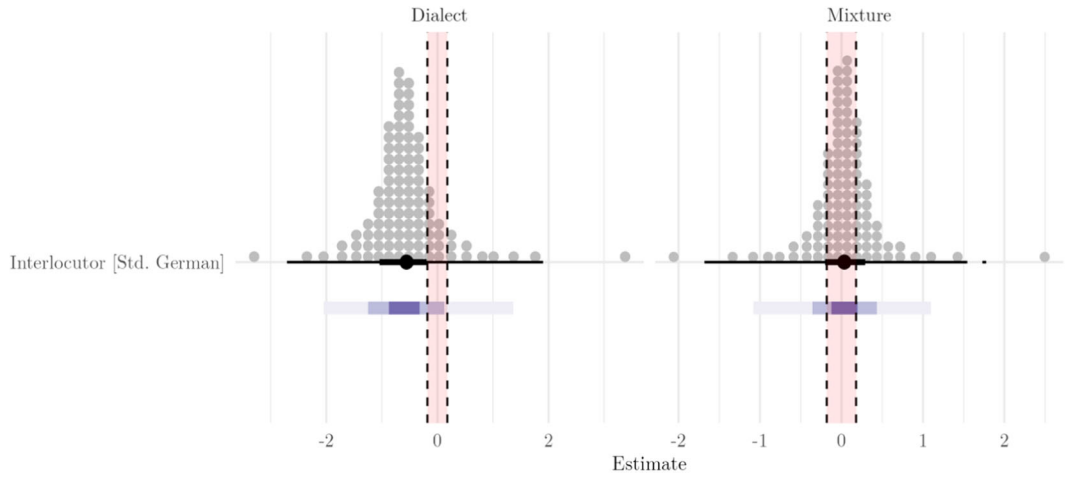

FIGURE 2 Visual summary of the Bayesian multinomial model.
[Color figure can be viewed at wileyonlinelibrary.com]
Note. These quantile dotplots illustrate on the log-odds scale the distribution of slope terms representing the change in log-odds ratio from the intercept (i.e., virtual reality [VR] dialect interlocutor) to the VR standard German interlocutor. Each dot represents a 1% likelihood of a given value. The purple-colored bars indicate (from darker to lighter) the 50%, 80%, and 95% highest density intervals (HDIs). The black point with bars is the posterior mean (the point), the 98% (thin bar), and 66% (thicker bar) HDIs. The shaded red area around point null is the region of practical equivalence (ROPE) set at ± 0.18.

When interacting with the standard German interlocutor in virtual space, two participants (10_j_30_c and 22_c_24_c) reduced their use of the dialect variety. Specifically, they made use of standard German variants in their otherwise comparatively dialect-near repertoires, hence the increase in the mixture variety. For instance, as Excerpts 1 and 2 illustrate, participant 10_j_30_c made notably less use of the Austro-Bavarian "a" darkening when interacting with the standard German interlocutor (e.g., standard "schade [pity]" vs. dialectal "schod"), though he did not avoid it entirely (e.g., dialectal "jo," "ova," and "ois" vs. standard "ja [yes]," "aber [but]," and "alles [everything]"). Conversely, in interaction with the dialect-speaking interlocutor, he employed "a" darkening at every available opportunity.

EXCERPT 1

Utterance to the standard-German-speaking interlocutor (10_j_30_c)
So mir gehts super eigentlich aiso. Jo schade, dass i: ni:d frua do woa (.) ova (.) na passt eh ois super.
So, I'm actually doing great. Yes, pity that I wasn't here earlier, but yeah everything is good.

EXCERPT 2

Utterance to the dialect-speaking interlocutor (10_j_30_c)
Bis jetz hob i: imma oa:foch (.) im dialekt ongfongt (.) und wonn de des ni:t vastehn donn sogns eh (.) 'wos host gsogt'.
Until now I have always just started in dialect and if they don't understand that then they say "what did you say?"

Other participants (e.g., 11_la_25_c, 16_a_25_c, 22_k_34_c, and 24_j_34_c) integrated dialect variants into their otherwise standard German repertoires, most notably when interacting with the dialect-speaking interlocutor. For example, Excerpts 3 and 4 illustrate that in interaction with the standard-German-speaking interlocutor, participant 16_a_25_c did not demonstrate practices of Austro-Bavarian "ch" reduction or "a" darkening in words such as standard German "ich [I]" or "aber

FIGURE 3 Intraspeaker variation in interaction with the virtual reality dialect- and standard-German-speaking interlocutor. [Color figure can be viewed at wileyonlinelibrary.com]

[but].” Conversely, when speaking with the dialect interlocutor, he produced both dialectal “i:” and standard German “ich” in neighboring utterances, and also engaged in Austro-Bavarian “a” darkening in words such as dialectal “hob” and “goa” versus standard German “habe [have]” and “gar [at all].”

EXCERPT 3

Utterance to the standard-German-speaking interlocutor (16_a_25_c)
Ich bleibe meistens in der stadt (…) aber na (.) ich liebe österreich wirklich und ich liebe salzburg.
I usually stay in the town (…) but no, I really love Austria and I love Salzburg.

EXCERPT 4

Utterance to the dialect-speaking interlocutor (16_a_25_c)
I: hob wirklich kein problem mit de salzburGERisch (…) aber (.) mit de oberösterreichisch oder de wienerisch (.) dann (.) ich versteh wirklich goa ni:t.
I really don’t have a problem with the Salzburg dialect (…) but with the Upper Austrian and Viennese dialect, then I don’t even understand anything.

Interestingly, three participants (i.e., 05_k_36_c, 18_j_31_c, and, though to a lesser extent, 29_v_28_c) even shifted away from the interlocutor variety by using mixture varieties in interaction with the standard-German-speaking interlocutor. As Excerpts 5 and 6 illustrate, in interaction with the standard-German-speaking interlocutor, participant 05_k_36_c produced Austro-Bavarian “l” vocalization (dialectal “aiso” vs. standard “also [well]”), definite article shifts (dialectal “des” vs. standard “das [the]”), and nasal deletion (dialectal “scho:” vs. standard “schon [even, already]”). Interestingly, in speaking with the dialect interlocutor, she did not produce any “l” vocalizations, nor did she engage in nasal deletion.

EXCERPT 5

Utterance to the standard-German-speaking interlocutor (05_k_36_c)
Aiso ich bin ich bin aus london und es gibt scho: ein paar dialekte, die auch als soziolekte (.) äh betrachtet werden können. Aiso es gibt den received pronunciation, des is dann was ich spreche.
Well, I am I am from London as there are definitely a few dialects that can be regarded as sociolects. There is the received pronunciation, that is what I speak.

EXCERPT 6

Utterance to the dialect-speaking interlocutor (05_k_36_c)
Also es wird auf jeden fall erwartet [dass man in formellen Situationen Standarddeutsch spricht] (.) also ich finde schon ein bisschen schade (.) ich verstehe nicht so ganz genau, warum wir (.) so keine wissenschaftskommunikation im dialekt machen können.
It is definitely expected [that one speaks standard German in formal situations], well I find it a bit of a pity, I don’t really understand why we can’t engage in academic communication in dialect.

This observed breadth concerning the degree to which participants used standard German, Austro-Bavarian dialect, and mixture varieties underscores the results of the Bayesian model, in that there was a notable amount of both inter- and intraindividual variation in the dataset. To do this variation justice, the next section investigates potential drivers behind the observed individuality in participants’ multivarietal repertoires.

TABLE 1 Ensemble 1: Participants' rationales for standard German(-near) repertoires.

Theme	Example
Personal L2 acquisitional history	[Standard German] is much easier. Well I have learned German in Germany and that was easier when I was there. (14_r_57_c)[a]
Perceptions of accessibility	In my German course, I have learned more High German. (10_m_43_c)
	On the internet for example, almost absolutely no dialect, almost everything is in High German. So it can be really difficult, for example, to find course books or something in dialect. You only experience dialect really only with colleagues or friends. (21_w_26_c)
Perceptions of difficulty	I find that High German is easier, and I love to speak High German (…) I know that the Austrian dialects have more [not intelligible] than High German, but High German is easier to immigrants like me. (09_m_21_c)
	I think that it is first easier and more useful that I first learn good High German. (07_t_41_c)
Social (i.e., peer) relationships with target-variety speakers	Usually my friends speak in High German, not in dialect. (10_m_43_c)

[a]This statement was double coded for the perceptions of difficulty theme.

Characterizing varietal repertoires: Unraveling the *inter* and *individual*

To explore potential "explanation[s] for the anomalies" (Regan, 2013, p. 45) concerning participants who stand out against the backdrop of the interindividual variation observed, the qualitative data shed light on individual drivers of the differential emergence of participants' L2 sociolinguistic, multivarietal repertoires. Importantly, these qualitative data do not speak explicitly to why participants behaved the way they did in interaction with the two virtual interlocutors, but rather to differences in their varietal repertoires on the whole. Based on visual categorization of the observed intraspeaker variation patterns and a more formal cluster analysis (see Appendix D), there appears to be three different types of varietal repertoires, broadly speaking: (a) Standard German(-near) repertoires, (b) dialect or mixture repertoires, and (c) dialect- or mixture-influenced standard German repertoires.

To start, the majority of the participants ($n = 28$) either avoided or were unable to produce mixture and dialect varieties. This underscores that acquiring L2 German in Austria—despite the coexistence of dialect and mixture varieties in everyday life—appears yet heavily influenced by the standard German variety. The learners in this ensemble had strict interest in the standard German variety, regardless of the prevalence of dialect in everyday life, as noted by participants (17_t_42_c), "High German is easy for me, and my family speaks dialect, Salzburg dialect, but I am learning High German," and (11_t_31_c), "My language is maybe High German (…) [I] am learning High German, but I hear my—my work colleagues and, and my girlfriend speaks dialect." This strict focus on standard German is a result of multicausal dynamics; the most notable themes are outlined in Table 1.

On the other side of the varietal coin, 10_j_30_c and 22_c_24_c predominantly used either dialect or mixture varieties. Interestingly, Participant 15_p_30_c clustered with the third ensemble (see later), though he was a clear outlier. Quantitatively, he was the sole participant in Ensemble 3 whose mixture varietal use outweighed his use of standard German, but he did not cluster with Ensemble 2 in light of their higher rates of dialect varietal use. Qualitatively, 15_p_30_c also more closely resembled the themes representative of Ensemble 2, likely because 15_p_30_c considered himself a dialect speaker (see self-inclusion theme in Table 2), despite integrating standard German features into his otherwise dialect clausal units (thus giving rise to higher rates of mixture varieties as opposed to strictly dialect ones). Table 2 details the three themes that appear complexly associated with participants whose use of nonstandard varieties—specifically, dialect and mixture varieties—outweighs their use of standard German.

TABLE 2 Ensemble 2: Participants' rationales for dialect or mixture varietal repertoires.

Theme	Example
Perceptions of difficulty or varietal economy	I mean the standard dialect [i.e., Austro-Bavarian dialect] is easy, it is easier for me than standard German. Standard German has a lot of these "ch" [not intelligible], so "ich" and "mich" and that is relatively difficult to pronounce. (15_p_30_c)
	I can't pronounce the "ch" (…) I can't pronounce it and so it is easier for me to speak Austrian or Salzburg dialect. (22_c_24_c)
	Well, for me, it's just natural to speak with a dialect. (10_j_30_c)
Social (i.e., peer, romantic, familial) relationships with target-variety speakers	Since I've been in Austria, I have always had a girlfriend actually (…) and there you just learn a bit of the dialects. (15_p_30_c)
	I just learned it [dialect] in the bars and with my friends. (22_c_24_c)
	A lot of chatting, [I] went out a lot, and through this I became integrated. (10_j_30_c)
Self-inclusion as a dialect speaker	I would almost, I would actually never speak High German. (15_p_30_c)
	For me, the dialect here is really the norm. (10_j_30_c)
	At work, for example, we only speak in dialect. (22_c_24_c)

TABLE 3 Ensemble 3: Participants' rationales for dialect- or mixture-influenced standard German varietal repertoires.

Theme	Example
Social inclusiveness and networking (as a means to increase social or familial well-being and/or to fulfill social-interactional face-saving objectives)	The people speak more dialect, and if you can speak dialect, then this is maybe a plus point for integration. (21_l_30_c)
	My boyfriend is from Lungau and his family and his friends can usually only speak dialect with each other. So, of course then, if you speak High German, then you feel a bit foreign in these situations. So then I have adapted myself a bit so I can at least speak a few dialectal words. (21_l_30_c)
	Sometimes I take a dialect word because that probably, well, sounds cute for example. (18_j_31_c)
External compulsory motives	I have to learn it [dialect]. I have to use it [dialect] or it [life] just doesn't work. (29_v_28_c)
	In life then, it is—everything is dialect. (24_j_34_c)
Internal or intrinsic drives	[I have been learning] more dialect. High German I find is just not, [it is] nothing new. (13_e_21_c)

Last, an ensemble of nine participants[8] displayed slightly more variable use of mixture (and, to a lesser extent, dialect) varieties than the first ensemble, but considerably less than the second. In terms of explaining this varietal behavior, there appear to be complex multicausal forces at play. Importantly, the majority of this ensemble underscored actively engaging with Austro-Bavarian dialect, specifically with the L2-related goal of acquiring it, as noted by Participants (11_la_25_c), "Well now I would like to deal with the Austrian dialect more," and (21_l_30_c), "To be honest, I have been learning more dialect than High German."

Given this, it appears that participants were in the process of integrating an increasing amount of dialect variants into their otherwise standard German repertoires, which gave rise to the higher relative rates of mixture clausal units in the data. This lends evidence to the assumption that these learners are in a sort of varietal (conscious and unconscious) experimentation phase. The rationales for participants' varietal experimentation and dialect-related goal orientations were found to be mirrored in the three themes outlined in Table 3. Importantly, this ensemble is distinct from Ensemble 2 for

two reasons: (a) This ensemble, as noted, is in the process of varietal experimentation, which effectively delimits them from the Ensemble 2, whose themes indicate that they are already past phases of experimentation—that is, they already identify as dialect speakers—and (b) the qualitative themes that emerged in this ensemble depict their rationales for experimenting with different varieties—that is, why they are actively choosing to expand their varietal repertoire. The qualitative themes from Ensemble 2, conversely, illustrate the processes through which they have already acquired dialect, and why they actively choose to employ primarily Austro-Bavarian dialect features as opposed to standard German ones.

DISCUSSION

Our findings further the results from ongoing research (Wirtz, 2024; Wirtz & Pfenninger, 2023a) concerning the structure and spectra of adult migrants' (multi)varietal repertoires in the Austro-Bavarian setting. The first aim of this study was to illustrate the degree to which L2 learners of German in the Austro-Bavarian setting engage in varietal convergence. Specifically, participants were subjected to a VR experiment, in which they interacted with a standard-German-speaking and dialect-speaking interlocutor in virtual space. At the interindividual level, there was no evidence of interlocutor-constrained varietal shifts. Participants were predicted to more heavily draw on the standard German variety, regardless of the interlocutor. These results support previous findings from the Swiss–Alemannic context (Ender, 2021, 2022) that L2 learners, at the group level, do not necessarily engage in varietal convergence in the same way L1 speakers do (see Wirtz, 2022). At the same time—though this comparison is to be taken with a grain of salt given the vast differences between the French and Austro-Bavarian sociolinguistic situations—our findings run slightly counter to Dewaele's (2004a) sample of L2 French learners, who interindividually converged to L1 speakers' patterns of variation. That said, the L2 French learners exclusively converged in terms of their frequency of "ne" deletion, but not with respect to the formal address pronoun "vous" versus the informal "tu" and the proportion of colloquial words (Dewaele, 2004b), indicating that (socio)linguistic convergence may be slightly more limited in practice. Additionally, our analysis was not conducted on the basis of frequency-based measurements of singled-out sociolinguistic variants, but rather on variety-based measurement practices, which arguably facilitate broader, more global measures concerning the extent to which learners mechanistically replicate and/or socially accommodate to the variety of the respective interlocutor.

Elsewhere (e.g., Geeslin et al., 2013; Kanwit, 2017, 2019, 2022; Larsen-Freeman & Cameron, 2008; Regan, 2013, 2022; Wirtz & Pfenninger, 2023b), it has been argued that, in light of individual variability and the common understanding of sociolinguistic competence as an individually owned process (Ender, 2022; Howard, 2012; Kinginger, 2008; Regan, 2010; van Compernolle & Williams, 2012), analyses of singled-out learners should be provided in addition to group aggregates. While there was no interindividual trend of varietal convergence in our data, the group-level estimates were not necessarily indicative of all the individuals, in that a few select participants adjusted their frequency profiles of standard German, dialect, and mixture varieties, albeit some more addressee dependently than others. In this vein, our results again corroborate previous findings from similar noninstructed naturalistic settings comprising dynamic dialect–standard constellations, specifically from the Swiss–Alemannic context. Visual inspection of participants' intraspeaker variation patterns revealed that select participants reduced their use of the dialect variety in interaction with the standard-German-speaking interlocutor, while others integrated dialect variants into their otherwise standard German repertoires (see also Ender, 2022), most notably when engaging with the dialect-speaking interlocutor in virtual space. Less target-like varietal shifting behavior was also observed in that select learners even diverged from the variety of the respective interlocutor. This appears to substantiate Ender's (2017) claim that parts of learners' L2 system may not be assigned to different varieties in a strict target-like way, speculatively because the varieties may be in a sort of "commu-

nicative freefall," that is, usable so long as the varietal mixing does not impact on nonproblematic communication.

Our findings also expand on existing insights (Wirtz, 2024; Wirtz & Pfenninger, 2023a) concerning which (psycho-)social and exposure-related factors impact on the acquisition of varietal resources. As a final goal, this study aimed to illustrate from an introspective, participant-subjective viewpoint the specificity of and drivers for differential outcomes in L2 learners' multivarietal sociolinguistic repertoires. Based on visual categorization of the observed intraspeaker variation patterns and a cluster analysis, there appeared to be three different types of varietal repertoires, broadly speaking: (a) Standard German(-near) repertoires, (b) dialect or mixture repertoires, and (c) dialect- or mixture-influenced standard German repertoires. The three ensembles were characterized by comparatively distinct themes, but there was also a certain degree of thematic overlap in potential drivers for the differential outcomes in varietal repertoires. For example, for participants with a standard German repertoire and dialect–mixture repertoire, perceptions of difficulty were often noted. Whereas the first ensemble perceived standard German to be associated with less difficulty, the learners employing primarily dialect or mixture varieties noted dialect as being more linguistically and economically assessable. Similarly, between all three ensembles, the effect of social factors manifested as potential drivers for the differences in learners' varietal behaviors: Whereas the standard German speakers (Ensemble 1) noted that their peer groups tended to predominately use standard German, the ensemble employing primarily dialect or mixture varieties underscored the impact of peer, familial, and romantic relationships with target-variety speakers on their acquisition of dialect. Ensemble 3 highlighted that their varietal experimentation and dialect-related goal orientations manifested in relation to their drive for social inclusion and networking in the target language community. These insights appear to confirm Ender's (2017, p. 178) hypothesis that "what the learners have finally incorporated as parts of their L2 system seems to be dependent on how they wanted to align linguistically with their surrounding community." The fact that some learners admitted to exclusive interest in standard German (Ensemble 1), whereas others heavily and knowingly used dialect and mixture varieties (Ensemble 2), emphasizes that

> second language learners or users can vary in terms of what they consider to be their ultimate goal in language acquisition, and of how far the use of the standard language and/or the local dialect not only serves as a means of communication but also bears social information. (Ender, 2017, p. 178)

What is more, variability has been found to be especially large during periods of rapid L2 development (e.g., Larsen-Freeman & Cameron, 2008; Pfenninger & Kliesch, 2023). Ensemble 3, who made primary use of standard German but indeed integrated dialect variants into their otherwise standard German-near repertoires, showed signs of varietal experimentation in terms of their intraspeaker variation patterns, which was underscored more readily by the qualitative introspective data. This variability may indicate that some of the learners in Ensemble 3 could be in the midst of a steep learning curve, given the notion that "learners in a rapid developmental phase may show relatively more variability than learners who have reached a more stable phase" (Verspoor & de Bot, 2022, p. 89). Longitudinal developmental data concerning the development of sociolinguistic competence (see, e.g., Wirtz & Pfenninger, 2024) can provide more comprehensive insights regarding how periods of high variability versus relative stability are indicative of growth in the sociolinguistic competence dimension.

Finally, this study contributes uniquely to two particular methodological aspects. First, there is a pressing need both in variationist sociolinguistics and SLA to develop methods and operational measures more suited to capturing stylistic variation and thus sociolinguistic competence. As a way to transcend the use of select sociolinguistic variants, Ender (2022) proposed investigating sociolinguistic competence in terms of learners' ability to shift speech styles and engage in accommodation processes based on the interlocutor. The locus of Austria with its range of sociolinguistically functional varieties (e.g., standard German and Austro-Bavarian dialect) makes this an ideal testing ground for such a

novel operationalization. That said, when taking convergence effects as a measure of sociolinguistic competence, it is crucial to control for human-inherent confounders, such as unintentional interviewer accommodation to the interviewee; neglecting such a methodological facet can impede generating stable between-participant comparisons. Our study draws on immersive VR technology as an elicitation instrument with prerecorded virtual interlocutors so as to maximally exclude the confounding effects characteristic of live oral interviews. This approach reconciles the ecological validity of interviews and conversation analysis and the experimental control of psycholinguistic designs. In addition to generating more socially, spatiotemporally, and contextually comparable data between participants, the immersive space affords a context-rich and communicative setting that simulates the complexity of everyday communication. On this view, VR instruments such as this one stand not only as a feasible substitute for more traditional oral semidirected or sociolinguistic interview, but also as a novel and useful method for SLA and sociolinguistics more generally (see, e.g., Peeters, 2019; Taguchi, 2021, 2022).

As with any new method, however, more research is needed in order to identify additional (dis)advantages of VR as an elicitation method. For example, although VR has been shown to provide an immersive, interactive, and emotionally engaging environment for L1 speakers (Wirtz, 2022), less is known about L2 learners' user experiences when interacting with VR technologies (but see Taguchi, 2021), particularly when the VR includes interactive conversational tasks between VR confederate and learner. What is more, as realistic as the immersive VR may be, it is still artificial to a degree. Comparative investigations between interactions with live versus VR interlocutors can shed light on whether learners' varietal behavior differs as a function of this modality.

CONCLUSION

The acquisition of sociolinguistic competence has repeatedly been underscored as an individually owned process mediated and modulated by sociolinguistic agency, orientations to language learning and variation, and, more generally, learners' envisioned place within the target language community. As Geeslin et al. (2013), Kanwit (2022), Larsen-Freeman and Cameron (2008), and Regan (2013), among others, underscored, this individuality and variability necessitate analyses of individuals in addition to mere group-level estimates. Our results underscore this, in that interindividually, there was little to no evidence that learners acquire the ability to varietally converge to the standard German or Austro-Bavarian dialect variety of the virtual interlocutor, which we operationally defined as sociolinguistic competence. That said, a few select learners indeed evinced variable varietal behavior, albeit some more target like than others. This nonnegligible degree of individuality contained within the dataset made it necessary to explore individual learners, their patterns of behavior, and how certain participants stood out against the backdrop of the group. Whereas the dataset could not explain *why* some participants adjusted their varietal behavior more addressee dependently than others and how this interpersonal varietal usage emerged, the introspective insights fostered a comprehensive understanding of potential drivers for different varietal repertoires (see the previous discussion). By combining quantitative methods with descriptive and qualitative approaches, it was possible to provide, as Kanwit (2017) put it, "a more telling snapshot of learner development" (p. 491) than when drawing on a single approach alone.

Such findings are of utmost importance in terms of their impact also on classroom instruction of sociolinguistic dialect–standard variation. To date, there remains yet an unimpressive amount of—and indeed an utter lack of empirically evaluated—pedagogical material targeting the structured acquisition of sociolinguistic competence for classroom-based teaching and learning in Austria (but for theoretical teaching units, see, e.g., Ruck, 2017; Wuensch & Bolter, 2020). Our results provide evidence that it is possible for learners to acquire sociolinguistic resources in the noninstructed Austro-Bavarian context (see also Wirtz & Pfenninger, 2023a); however, as detailed above, only a few participants changed their frequency profiles of dialect, standard, and mixed speech addressee

dependently, and not always in the hypothesized direction, resulting in what Howard (2012) referred to as "imbalanced sociolinguistic profiles" (p. 31). Such imbalance may be a critical starting point of attack for pedagogical material in raising awareness of variation and diversity at the structural level and also of the various social and personal functions, patterns of use, and normative judgements linked to linguistic variation and in improving the ability to wield dialect–standard variation for L2 learners with this productive goal. Specifically, it is necessary for approaches to be developed and empirically evaluated that guide learners in (a) acquiring varietal resources that align with their goals in navigating the Austro-Bavarian context, and (b) applying these in contextually sensitive ways, especially as this is an ability that learners do not appear to develop in the noninstructed setting, generally speaking. Classroom activities should provide learners with the abilities to better perceive differences in speech related to social contexts and to sharpen their awareness about differential use and the implied socioindexicality of dialect and standard speech. Relatedly, it will be important for future research to address how such imbalanced sociolinguistic profiles are perceived by L1 speakers, as well as the observed mixture varieties that learners use to partially align with the surrounding linguistic usage. This would also provide insights concerning how the differential use of varieties by L2 learners can hinder and/or facilitate communication in different sociolinguistic contexts. At the broadest level, pedagogical material geared toward the development of sociolinguistic resources in the L2 should strive to outline the potential social functionality alongside the inherent individuality of varietal use, taking care to countenance the heterogeneity in usage necessities and personal histories of learners.

In a similar vein, VR has been receiving increased attention in recent years as a promising tool to promote L2 learning (e.g., Blyth, 2018; Lan, 2020). Taguchi (2022) outlined several reasons for this: (a) VR provides real-life, sensory-rich settings and so facilitates contextualized learning, (b) the VR setting aids in the development of spatial knowledge, which can transfer to real-life interactions, (c) VR promotes learner autonomy and agency, which in turn can stimulate engagement in L2 learning, and (d) VR provides a safe environment in which learners can use their L2 without fear of making mistakes and losing face. These affordances make VR exceptional in terms of its educational purposes, and the increase in accessibility makes it particularly suitable for instructional tasks, for example, in the language classroom to teach and train sociolinguistic competence.

Finally, future research should make it a goal to investigate how far the drivers for differential development of sociolinguistic repertoires form constitutive and co-adaptive relationships at some points in time and compete at others, which necessarily invites (micro)longitudinal perspectives on sociolinguistic development. This ties into the need to more carefully differentiate between and investigate the specificities involved in intralearner variation (i.e., when two or more target-like and non-target-like forms are in [free] variation), intraspeaker variation (i.e., use of a variety of target-like forms to express an identical range of functions and meanings), and intraindividual variability (i.e., change over time). This can aid in attempts to generate a general theory for development of intraindividual variation in L2 learners, specifically as concerns the acquisition and development of sociolinguistic competence in the L2.

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ENDNOTES

[1] We note that (a) we employ the term "Bavarian" in its dialectological sense, meaning it refers to eastern varieties of Upper German, which are spoken in much of Austria and Southern Germany, and (b) in German-speaking sociolinguistics, the term "dialect" is used in the spirit of "local base dialect" or "local vernacular" and is not synonymous to "any language variety."

[2] This varietal convergence toward the variety of the interlocutor has been positioned as a complex interaction between social and mechanistic processes (Ender & Kaiser, 2010). Whether varietal convergence and alignment processes on the whole are socially motivated (e.g., accommodation theory [Giles et al., 1991] or audience design [Bell, 1984]) or more automatic-mechanistically driven (e.g., interactive alignment; e.g., Pickering & Garrod, 2004]) is not put forth for discussion in this contribution.

[3] https://www.iris-database.org/ (experimental materials); https://osf.io/myhgw/ (quantitative analyses and qualitative coding procedures).

[4] The study was approved by the Ethics Committee of the University of Salzburg (EK-GZ 40/2021), and participants were compensated 20€ after finishing the experimental procedure in its entirety.

[5] Given that this task was but one in a larger test battery lasting on average slightly over 2 hours, participants only interacted with women VR interlocutors rather than with men interlocutors as well. Our decision not to balance the gender of the interlocutors in the VR tasks was made out of deference to participants, specifically to avoid lengthening the VR task and thus to minimize participant fatigue and dropout.

[6] In line with previous variationist work in the Austro-Bavarian context (e.g., Bülow & Vergeiner, 2021; Kaiser, 2019, 2022; Vergeiner, 2020, 2021), we refrain from employing acoustic analyses of the respective variables, primarily because of the clear perceptual salience of standard German versus Austro-Bavarian dialect features. With this in mind, however, our claims regarding (non)accommodation by L2 learners of German concern chiefly the level of sound.

[7] The thematic orientations of the questions posed in virtual space were based on the qualitative insights Ender (2017, 2021, 2022) generated for her L2 learners of German in the Swiss–Alemannic context: social experiences, expectations and relationships toward the surrounding L2 community, and speakers' target place and future goals within said community. Ender evinced that such drivers were central criteria in shaping learners' inclusion or exclusion of local varieties into their varietal repertoire.

[8] These nine participants were: 05_k_36_c, 18_j_31_c, 22_k_34_c, 13_e_21_c, 29_v_28_c, 24_j_34_c, 11_la_25_c, 21_l_30_c, and 16_a_25_c.

REFERENCES

Amin, A., Gromala, D., Tong, X., & Shaw, C. (2016). Immersion in cardboard VR compared to a traditional head-mounted display. In S. Lackey & R. Shumaker (Eds.), *Virtual, augmented and mixed reality* (pp. 269–276). Springer.

Beaman, K. V. (2020). Identity and mobility in linguistic change across the lifespan: The case of Swabian German. In A. Ziegler, S. Edler, & G. Oberdorfer (Eds.), *Urban matters: Current approaches of international sociolinguistic research* (pp. 27–60). John Benjamins.

Beaman, K. V. (2021). *Coherence in real- and apparent-time: A sociolinguistic variationist investigation of language change in Swabia* [Unpublished doctoral dissertation]. Queen Mary University, London.

Bell, A. (1984). Language style as audience design. *Language in Society*, *13*, 145–204. https://doi.org/10.1017/S004740450001037X

Bellamy, J. (2012). *Language attitudes in England and Austria: A sociolinguistic investigation into perceptions of high and low-prestige varieties in Manchester and Vienna*. Franz Steiner Verlag.

Blyth, C. (2018). Immersive technologies and language learning. *Foreign Language Annals*, *51*, 225–232. https://doi.org/10.1111/flan.12327

Bülow, L., & Vergeiner, P. C. (2021). Intra-individual variation across the lifespan: Results from an Austrian panel study. *Linguistics Vanguard*, *7*, 1–11. https://doi.org/10.1515/lingvan-2020-0026

Bürkner, P.-C. (2017). brms: An R package for Bayesian multilevel models using Stan. *Journal of Statistical Software*, *80*, 1–28. https://doi.org/10.18637/jss.v080.i01

de Fina, A., & Perrino, S. (2011). Introduction: Interviews vs. 'natural' contexts: A false dilemma. *Language in Society*, *40*, 1–11. https://doi.org/10.1017/S0047404510000849

Dewaele, J.-M. (2002). Using socio-stylistic variants in advanced French interlanguage: The case of *nous/on*. *Eurosla Yearbook*, *2*, 205–226. https://doi.org/10.1075/eurosla.2.13dew

Dewaele, J.-M. (2004a). Retention or omission of the *ne* in advanced French interlanguage: The variable effect of extralinguistic factors. *Journal of Sociolinguistics*, *8*, 433–450. https://doi.org/10.1111/j.1467-9841.2004.00268.x

Dewaele, J.-M. (2004b). Vous or tu? Native and non-native speakers of French on a sociolinguistic tightrope. *International Review of Applied Linguistics*, *42*, 383–402. https://doi.org/10.1515/iral.2004.42.4.383

ELAN. (2021). *ELAN*. Max Planck Institute for Psycholinguistics, The Language Archive. https://archive.mpi.nl/tla/elan

Ender, A. (2015). Von Schlössern und Schlüsseln in der Integration–Das Machtgefüge von Dialekt und Standard für den Zweitsprachgebrauch in der Deutschschweiz [Of locks and keys in integration: The power structure of dialect and standard for second language use in German-speaking Switzerland]. In P. Anreiter, E. Mairhofer, & C. Posch (Eds.), *ARGUMENTA. Festschrift für Manfred Kienpointner zum 60. Geburtstag* (pp. 93–110). Praesens.

Ender, A. (2017). What is the target variety? The diverse effects of standard–dialect variation in second language acquisition. In G. De Vogelaer & M. Katerbow (Eds.), *Acquiring sociolinguistic variation* (pp. 155–184). Benjamins.

Ender, A. (2021). The standard-dialect repertoire of second language users in German-speaking Switzerland. In A. Ghimenton, A. Nardy, & J.-P. Chevrot (Eds.), *Sociolinguistic variation and language acquisition across the lifespan* (pp. 251–275). John Benjamins.

Ender, A. (2022). *Dialekt-Standard-Variation im ungesteuerten Zweitspracherwerb des Deutschen. Eine soziolinguistische Analyse zum Erwerb von Variation bei erwachsenen Lernenden* [Dialect-standard variation in untutored second language acquisition of German. A sociolinguistic analysis on the acquisition of variation in adult learners]. De Gruyter.

Ender, A., & Kaiser, I. (2009). Zum Stellenwert von Dialekt und Standard im österreichischen und Schweizer Alltag–Ergebnisse einer Umfrage [On the importance of dialect and standard in Austrian and Swiss everyday life: Results of a survey]. *Zeitschrift Für Germanistische Linguistik*, *37*, 266–295. https://doi.org/10.1515/ZGL.2009.018

Ender, A., & Kaiser, I. (2010). A cognitive approach to sociolinguistic variation in Austria: Diglossia or dialect-standard-continuum in speakers' awareness and usage. In *34th International LAUD Symposium; March 15–18, 2010* (pp. 377–398). University of Duisburg-Essen.

Ender, A., Kasberger, G., & Wirtz, M. A. (2023). Standard- und Dialektbewertungen auf den Grund gehen: Individuelle Unterschiede und subjektive Theorien hinsichtlich Dialekt- und Standardaffinität bei Personen mit Deutsch als Zweitsprache im bairischsprachigen Österreich [Getting to the bottom of standard and dialect evaluations: Individual differences and subjective theories regarding dialect and standard affinity among German-as-a-second-language speakers in Bavarian-speaking Austria]. *Zeitschrift Für Deutsch Im Kontext Von Mehrsprachigkeit*, *1*, 8–25. https://www.vr-elibrary.de/doi/10.14220/odaf.2023.39.1.8

Fox, J., Arena, D., & Bailenson, J. N. (2018). Virtual reality: A survival guide for the social scientist. *Behavior Research Methods*, *50*, 862–869. https://doi.org/10.1027/1864-1105.21.3.95

Geeslin, K. L. (2010). Beyond "naturalistic": On the role of task characteristics and the importance of multiple elicitation methods. *Studies in Hispanic and Lusophone Linguistics*, *3*, 501–520. https://doi.org/10.1515/shll-2010-1084

Geeslin, K. L. (2018). Variable structures and sociolinguistic variation. In P. A. Malovrh & A. G. Benati (Eds.), *The handbook of advanced proficiency in second language acquisition* (pp. 547–565). Wiley-Blackwell.

Geeslin, K. L., Linford, B., Fafulas, S., Long, A. Y., & Díaz-Campos, M. (2013). The L2 development of subject form variation in Spanish: The individual vs. the group. In J. Cabrelli, G. Lord, A. De Prada Pérez, & J. Aaron (Eds.), *Selected Proceedings of the 16th Hispanic Linguistics Symposium* (pp. 156–174). Cascadilla Proceedings Project.

Geeslin, K. L., & Long, A. Y. (2014). *Sociolinguistics and second language acquisition. Learning to use language in context*. Routledge.

Gelman, A., Simpson, D., & Betancourt, M. (2017). The prior can often only be understood in the context of the likelihood. *Entropy*, *19*, 1–13. https://doi.org/10.3390/e19100555

Giles, H., Coupland, N., & Coupland, J. (1991). Accommodation theory: Communication, context, and consequence. In H. Giles, N. Coupland, & J. Coupland (Eds.), *Contexts of accommodation. Developments in applied linguistics*. (pp. 1–68). Cambridge University Press.

Gudmestad, A., House, L., & Geeslin, K. L. (2013). What a Bayesian analysis can do for SLA: New tools for the sociolinguistic study of subject expression in L2 Spanish. *Language Learning*, *63*, 371–399. https://doi.org/10.1111/lang.12006

Howard, M. (2012). The advanced learner's sociolinguistic profile: On issues of individual differences, second language exposure conditions, and type of sociolinguistic variable. *Modern Language Journal*, *96*, 20–33. https://doi.org/10.1111/j.1540-4781.2012.01293.x

Kaiser, I. (2019). Dialekt-Standard-Variation in Deutsch bei mehrsprachigen Kindern in Österreich [Dialect standard variation in German among multilingual children in Austria]. *ÖDaF-Mitteilungen*, *35*, 68–84. https://doi.org/10.14220/odaf.2019.35.1.68

Kaiser, I. (2022). Children's linguistic repertoires across dialect and standard speech: Mirroring input or coconstructing sociolinguistic identities? *Language Learning and Development*, *18*, 41–61. https://doi.org/10.1080/15475441.2021.1922282

Kaiser, I., & Ender, A. (2021). Intra-individual variation in adults and children: Measuring and conceptualizing individual dialect–standard repertoires. *Linguistics Vanguard*, *7*, 1–11. https://doi.org/10.1515/lingvan-2020-0032

Kanwit, M. (2017). What we gain by combining variationist and concept-oriented approaches: The case of acquiring Spanish future-time expression. *Language Learning*, *67*, 461–498. https://doi.org/10.1111/lang.12234

Kanwit, M. (2019). Beyond the present indicative: Lexical futures as indicators of development in L2 Spanish. *Modern Language Journal*, *103*, 481–501. https://doi.org/10.1111/modl.12566

Kanwit, M. (2022). Sociolinguistic competence: What we know so far and where we're heading. In K. L. Geeslin (Ed.), *The Routledge handbook of second language acquisition and sociolinguistics* (pp. 30–44). Routledge.

Kanwit, M., & Solon, M. (Eds.). (2023). *Communicative competence in a second language: Theory, method, and applications*. Routledge. https://doi.org/10.4324/9781003160779

Kinginger, C. (2008). Language learning in study abroad: Case studies of Americans in France. *Modern Language Journal*, *92*, 1–131. https://doi.org/10.1111/j.1540-4781.2008.00821.x

Kleiner, S., & Knöbl, R. (2015). Einleitung [Introduction]. In D. Verlag (Ed.), *Duden. Das Aussprachewörterbuch* (pp. 9–160). Dudenverlag.

Kruschke, J. K. (2018). Rejecting or accepting parameter values in Bayesian estimation. *Advances in Methods and Practices in Psychological Science*, *1*, 270–280.
Labov, W. (1966). *The social stratification of English in New York City*. Center for Applied Linguistics.
Labov, W. (1972). Some principles of linguistic methodology. *Language in Society*, *1*, 97–120. https://doi.org/10.1017/S0047404500006576
Labov, W. (1990). The intersection of sex and social class in the course of linguistic change. *Language Variation and Change*, *2*, 205–254. https://doi.org/10.1017/S0954394500000338
Lan, Y.-J. (2020). Immersion, interaction, and experience-oriented learning: Bringing virtual reality into FL learning. *Language Learning & Technology*, *24*, 1–15. http://hdl.handle.net/10125/44704
Larsen-Freeman, D., & Cameron, L. (2008). *Complex systems and applied linguistics*. Oxford University Press.
Levshina, N. (2015). *How to do linguistics with R: Data exploration and statistical analysis*. John Benjamins.
Lippi-Green, R. L. (1989). Social network integration and language change in progress in a rural alpine village. *Language in Society*, *18*, 213–234. https://doi.org/10.1017/S0047404500013476
Long, A. Y. (2022). Commonly studied language pairs. In K. L. Geeslin (Ed.), *The Routledge handbook of second language acquisition and sociolinguistics* (pp. 420–432). Routledge.
Milroy, L., & Gordon, M. (2003). *Sociolinguistics: Method and interpretation*. Blackwell.
Papachristos, N. M., Vrellis, I., & Mikropoulos, T. A. (2017). A comparison between Oculus Rift and a low-cost smartphone VR headset: Immersive user experience and learning. *IEEE 17th International Conference on Advanced Learning Technologies*, 477–481. https://doi.org/10.1109/ICALT.2017.145
Peeters, D. (2019). Virtual reality: A game-changing method for the language sciences. *Psychonomic Bulletin & Review*, *26*, 894–900. https://doi.org/10.3758/s13423-019-01571-3
Pfenninger, S. E., & Kliesch, M. (2023). Variability as a functional marker of second language development in older adult learners. *Studies in Second Language Acquisition*, *45*, 1004–1030. https://doi.org/10.1017/S0272263123000013
Pickering, M. J., & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences*, *27*, 169–190. https://doi.org/10.1017/S0140525X04000056
R Core Team. (2020). *R: A language and environment for statistical computing. R Foundation for Statistical Computing*. https://www.R-project.org/
Regan, V. (1996). Variation in French interlanguage: A longitudinal study of sociolinguistic competence. In R. Bayley & D. Preston (Eds.), *Second language acquisition and linguistic variation* (pp. 177–201). John Benjamins.
Regan, V. (2010). Sociolinguistic competence, variation patterns and identity construction in L2 and multilingual speakers. *EUROSLA Yearbook*, *10*, 21–37. https://doi.org/10.1075/eurosla.10.04reg
Regan, V. (2013). The bookseller and the basketball player: Tales from the French Polonia. In D. Singleton, V. Regan, & E. Debaene (Eds.), *Linguistic and cultural acquisition in a migrant community* (pp. 28–48). Multilingual Matters.
Regan, V. (2022). Variation, identity and language attitudes. In R. Bayley, D. R. Preston, & X. Li (Eds.), *Variation in second and heritage languages* (pp. 253–278). Benjamins.
Rehner, K. (2002). *The development of aspects of linguistic and discourse competence by advanced second language learners of French* [Unpublished doctoral dissertation]. OISE/University of Toronto.
Ruck, J. (2017). Against all standards: On regional variation in the German language classroom. *Critical Multilingualism Studies*, *5*, 112–143. https://cms.arizona.edu/index.php/multilingual/article/view/85
Schilling-Estes, N. (2008). Stylistic variation and the sociolinguistic interview: A reconsideration. In R. Monroy & A. Sánchez (Eds.), *25 years of applied linguistics in Spain: Milestones and challenges. Proceedings from AESLA 25* (pp. 971–986). Servicio de Publicaciones de la Universidad de Murcia.
Soukup, B. (2009). *Dialect use as interaction strategy. A sociolinguistic study of contextualization, speech perception, and language attitudes in Austria*. Braumüller.
Staples, S., & Biber, D. (2015). Cluster analysis. In L. Plonsky (Ed.), *Advancing quantitative methods in second language research* (pp. 243–274). Routledge.
Steinegger, G. (1998). *Sprachgebrauch und Sprachbeurteilung in Österreich und Südtirol, Ergebnisse einer Umfrage* [Language use and language evaluation in Austria and South Tyrol, results of a survey]. Peter Lang.
Stratton, J. M. (2020). Adjective intensifiers in German. *Journal of Germanic Linguistics*, *32*, 183–215. https://doi.org/10.1017/S1470542719000163
Stratton, J. M. (2022). Tapping into German adjective variation: A variationist sociolinguistic approach. *Journal of Germanic Linguistics*, *34*, 63–102. https://doi.org/10.1017/S1470542721000088
Taguchi, N. (2021). Application of immersive virtual reality to pragmatics data collection methods: Insights from interviews. *CALICO Journal*, *38*, 181–201. https://doi.org/10.1558/cj.41136
Taguchi, N. (2022). Immersive virtual reality for pragmatics task development. *TESOL Quarterly*, *56*, 308–335. https://doi.org/10.1002/tesq.3070
van Compernolle, R. A. (2019). Constructing a second language sociolinguistic repertoire: A sociocultural usage-based perspective. *Applied Linguistics*, *40*, 871–893. https://doi.org/10.1093/applin/amy033
van Compernolle, R. A., & Williams, L. (2012). Reconceptualizing sociolinguistic competence as mediated action: Identity, meaning-making, agency. *Modern Language Journal*, *96*, 234–250. https://doi.org/10.1111/j.1540-4781.2012.01334.x

Vanrell, M. del M., Feldhausen, I., & Astruc, L. (2018). The discourse completion task in romance prosody research: Status quo and outlook. In I. Feldhausen, J. Fliessbach, & M. del Mar Vanrell (Eds.), *Methods in prosody: A romance language perspective* (pp. 191–227). Language Science Press.

Vergeiner, P. C. (2020). Sprachnormbezogene Akkommodation in der Hochschullehre [Language norm-related accommodation in higher education teaching]. *Zeitschrift Für Angewandte Linguistik*, *72*, 33–62. https://doi.org/10.1515/zfal-2020-2027

Vergeiner, P. C. (2021). *Bewertungen—Erwartungen—Gebrauch: Sprachgebrauchsnormen zur inneren Mehrsprachigkeit an der Universität* [Assessments—Expectations—Usage: Language use norms for internal multilingualism at the university]. Steiner.

Verspoor, M. H., & de Bot, K. (2022). Measures of variability in transitional phases in second language development. *International Review of Applied Linguistics in Language Teaching*, *60*, 85–101. https://doi.org/10.1515/iral-2021-0026

Wiesinger, P. (1990). Standardsprache und Mundarten in Österreich [Standard language and dialects in Austria]. In G. Stickel (Ed.), *Deutsche Gegenwartssprache Tendenzen und Perspektiven* [German contemporary language tendencies and perspectives] (pp. 218–232). de Gruyter. https://doi.org/10.1515/9783110622423

Wirtz, M. A. (2022). Discourse completion tasks meet virtual reality: A pilot study on virtual reality as an elicitation instrument. *Research Methods in Applied Linguistics*, *1*, 1–12. https://doi.org/10.1016/j.rmal.2022.100029

Wirtz, M. A. (2024). On the relationship between complexity of primary occupation and L2 varietal behavior in adult migrants in Austria. *Linguistics Vanguard*.

Wirtz, M. A., & Pfenninger, S. E. (2023a). Capturing thresholds and continuities: Individual differences as predictors of L2 sociolinguistic repertoires in adult migrant learners in Austria. *Applied Linguistics*, https://doi.org/10.1093/applin/amad055

Wirtz, M. A., & Pfenninger, S. E. (2023b). Variability and individual differences in L2 sociolinguistic evaluations: The GROUP, the INDIVIDUAL and the HOMOGENEOUS ENSEMBLE. *Studies in Second Language Acquisition*, *45*, 1186–1209. https://doi.org/10.1017/S0272263123000177

Wirtz, M. A., & Pfenninger, S. E. (2024). Signature dynamics of development in L2 sociolinguistic competence: Evidence from an intensive micro-longitudinal study. *Language Learning*.

Wolfson, N. (1976). Speech events and natural speech: Some implications for sociolinguistic methodology. *Language in Society*, *5*, 189–209. https://doi.org/10.1017/S0047404500007028

Wuensch, J., & Bolter, D. (2020). Is a Schtoan a Stein? How and why to teach dialects and regional variations in the German language classroom. *German as a Foreign Language*, *2*, 59–78. http://www.gfl-journal.de/2-2020/tm_Wuensch-Bolter.pdf

Ziegler, A., Oberdorfer, G., & Herbert, K. (2021). The Austrian case: Diminutives and their variation in spoken interaction in urban areas. In A. Ziegler, S. Edler, & G. Oberdorfer (Eds.), *Urban matters: Current approaches in variationist sociolinguistics* (pp. 203–226). John Benjamins.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A

Prior specifications and model fitting

Models were fitted with weakly informative priors (Gelman et al., 2017) for the intercept, that is, $Normal(\mu = 0, \sigma = 10)$, and for the population-level estimate, that is, $Normal(\mu = 0, \sigma = 7)$. All models were fitted with 2000 iterations (1000 warm-up). Hamiltonian Monte Carlo sampling was carried out with 4 chains in order to draw samples from the posterior predictive distribution.

```
#################### #
# * set seed ----
#################### #
set.seed(4444)

#################### #
# * formula ----
#################### #
formula = variety ~
  Interlocutor +
  (1 | id) +
  (1 | situation)

#################### #
# * weakly informative priors ----
#################### #
weak_priors = c(prior(normal(0, 10), class = Intercept, dpar = mudialectCU),
                prior(normal(0, 10), class = Intercept, dpar = mumixtureCU),
                prior(normal(0, 7), class = b, coef = InterlocutorStandard, dpar = mudialectCU),
                prior(normal(0, 7), class = b, coef = InterlocutorStandard, dpar = mumixtureCU))

# RUN MODELS ------------------------------------------------------------------

if(T){

  #################### #
  # * inter-individual accommodation ----
  #################### #
  mod_interPers_diff = brm(formula,

                           # add model priors
                           prior = weak_priors,

                           # using all availables cores
                           cores = parallel::detectCores(),

                           # adjusting the delta step size
                           control = list(adapt_delta = 0.999,
                                          max_treedepth = 15),

                           # data
                           data = df_interPers,

                           # multinomial model
                           family = categorical(link = "logit"))


  #################### #
  # * save models ----
  #################### #
  saveRDS(mod_interPers_diff,
          file = "./data/models/mod_interPers_diff.rds")

}
```

APPENDIX B

Coding schemes

DEDUCTIVE CODING SCHEME

Situational use of dialect (VRSet1, DQ1–DQ3)
Meta-knowledge of L1 varietal landscape (VRSet1, SQ1–SQ33)
Subjective well-being in Austria (VRSet2, SQ1, SQ3)
Future plans in Austria (VRSet2, SQ2)
Relations to the L2 (dialectal) environment (VRSet2, DQ1)
Self-perception of varietal acquisition (VRSet2, DQ1–DQ33)

INDUCTIVE CODING SCHEME

The deductive coding scheme was taken as a basis for the inductive coding schemes. In order to identify more fine-grained themes that motivated differences in subjects' varietal repertoires, each participant statement was analyzed individually to map out all potential themes. After the statements

were analyzed individually, the relationships between the "micro-themes" were examined, and a total of eight themes emerged, and were defined as follows:

- **Internal or intrinsic drives** (drive for wanting to learn a specific variety)
- **Compulsion** (feeling social pressure to learn a variety, feeling required to learn a variety)
- **Social inclusiveness** (learning a variety to be more socially included)
- **Dialect/standard German speaker** (identifying as a speaker of a standard German or dialect variety, with a focus on peer, romantic, and familial relationships)
- **Social relationships w/ target-variety speakers** (descriptions of learners' relationships with target-variety speakers)
- **Language economy/difficulty** (perceived difficulty of a variety, or speaking a variety because it is perceived to be easier to speak than other varieties)
- **Accessibility** (accessibility of resources concerning the learning of a variety)
- **Personal histories** (learners' histories in interactions with varieties, and thus how individual histories shaped their current varietal repertoires)

Some of these themes were specific to certain types of varietal repertoires (e.g., internal or intrinsic drives were common in Ensemble 3, who used all three varieties consistently and who appeared to be in an experimentation phase), other themes emerged across different types of varietal repertoires (e.g., language economy–difficulty theme emerged across the first two ensembles, who had more steady repertoires of either standard German or dialect or mixture varieties). Examples of these themes are given in the article.

APPENDIX C
Descriptive statistics and model summary

TABLE C1 Descriptive statistics of interpersonal varietal behavior (in %).

Interlocutor	Variety	Mean	Median	*SD*	Minimum	Maximum
Dialect	Dialect	0.06	0.00	0.16	0.00	0.76
Dialect	Mixture	0.11	0.04	0.14	0.00	0.56
Dialect	Standard	0.83	0.94	0.25	0.06	1.00
Standard	Dialect	0.04	0.00	0.10	0.00	0.56
Standard	Mixture	0.12	0.03	0.17	0.00	0.63
Standard	Standard	0.85	0.97	0.24	0.07	1.00

TABLE C2 Descriptive statistics of interpersonal varietal behavior (absolute values).

Interlocutor	Variety	Mean	*SD*	Median	Range
Dialect	Dialect	2.92	7.17	0.00	0–37
Dialect	Mixture	5.38	8.91	1.00	0–40
Dialect	Standard	33.9	17.90	29.00	3–80
Standard	Dialect	1.75	4.66	0.00	0–25
Standard	Mixture	5.52	9.55	1.00	0–41
Standard	Standard	32.6	17.00	30.0	3–73

TABLE C3 Numeric model summary (on the log-odds scale).

Parameter	β	95% HDI	ROPE	% in ROPE
Dialect[a]: Intercept[b]	−4.87	[−6.72, −3.28]	±0.18	0.00
Mixture: Intercept	−3.13	[−4.29, −2.09]	±0.18	0.00
Dialect: Interlocutor [Std. German][c]	−0.55	[−2.05, 1.36]	±0.18	9.21
Mixture: Interlocutor [Std. German]	0.03	[−1.08, 1.10]	±0.18	55.95

[a]The "dialect" and "mixture" before each parameter indicate the log-odds ratio of producing the dialect or mixture variety in function of the respective predictor variable.

[b]The intercept for multinomial models indicates the log-odds ratio that a randomly chosen participant would produce a dialect variety and mixture variety as opposed to the standard German variety with the dialect-speaking virtual reality (VR) interlocutor.

[c]The [standard German] slope terms represent the change in log-odds ratio from the intercept (i.e., VR dialect interlocutor) toward the VR standard German interlocutor. For example, a negative log-odds ratio would indicate that the odds of producing a dialect or mixture variety against standard German decrease in interaction with the standard German interlocutor compared to the dialect-speaking VR interlocutor.

APPENDIX D

Cluster analysis

We conducted a hierarchical cluster analysis (HCA) on the interpersonal varietal behavior data, which is a multivariate exploratory technique used for identifying new groups or patterns in a bottom-up manner (Staples & Biber, 2015). Within the HCA, we used the Manhattan distance matrix to quantify and reflect the (dis)similarity between individuals. We adopted Ward's method as a linkage method so as to minimize within-cluster variance during the clustering process. On the whole, the HCA computes subgroups of similar "objects" in the data, in this case subgroups of similarly behaving learners. The cluster analysis took into account the 40 subjects' relative varietal usage in the virtual reality oral dialogue construction tasks. In this spirit, the data are analyzed in terms of how many and into which groups of similarly behaving individuals the subjects can be reasonably divided.

The optimal cluster solution was determined on the basis of the average silhouette width, the values of which can range between 0 and 1. Values closer to 0 indicate less cluster structure in the data, and values closer to 1 suggest better separation of all clusters from one another. As a rule of thumb, an average silhouette width below 0.2 indicates a lack of substantial cluster structure in the data (Levshina, 2015, p. 311). The best average silhouette width was obtained with a three-cluster solution, with a value of 0.679, which is illustrated in SF1 below by the blue (Cluster I), red (Cluster II), and green (Cluster III) frames.