

RESEARCH ARTICLE 

Spanish heritage language learners' motivational profile in the postsecondary classroom: Insights from psychological network modeling

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Abstract

This study sought to investigate the psychological network structure of adult Spanish heritage language (HL) learners' motivational profile by considering interconnections among the following variables: the possible HL selves, family influence, intended HL learning effort, HL achievement goal orientations, HL enjoyment, HL anxiety, perceived classroom environment, and critical language awareness. In line with a complex systems perspective, mutually interdependent connections among variables were estimated using psychological network modeling. The analysis revealed a majority of positive associations among the system constituents, with nodes representing the possible HL selves, HL enjoyment, and intended HL learning effort holding the most central influence on the network. Results also shed light on the unexplored relevance of critical language awareness in understanding HL learners' motivational and emotional dispositions. We discuss the theoretical, pedagogical, and methodological implications of the study, highlighting the potential of network analysis for providing insights into complex psychological phenomena.

During the last decades, substantive empirical work has focused on understanding language-learning motivation. However, previous research was overwhelmingly centered on traditional second (L2) and foreign language (FL) learner populations, with little attention directed toward heritage language (HL) learners. As early bilingual speakers of a minority/minoritized language, HL learners' multifaceted linguistic experiences are different from those associated with traditional L2 and FL learners (e.g., Bowles, 2018; Montrul, 2016; Ortega, 2020; Potowski, 2002), and their motivational profiles are also likely to differ. With this in mind, the primary goal of this study was to explore interconnections among psychoaffective variables relevant to language-learning motivation in the context of Spanish heritage bilingualism in postsecondary education.

Another goal of this study was to further illustrate the potential of novel psychological network modeling techniques (e.g., Constantini et al., 2015; Epskamp & Fried,

2018; Epskamp *et al.*, 2018) for advancing the quantitative researchability of complex systems in language-learning motivation and learner psychology more broadly (see Freeborn *et al.*, 2022). Although it is widely acknowledged that motivation exhibits all the processes that characterize complex dynamic systems—including nonlinear, multiple, unstable, and continuously changing interactions among its many dimensions (e.g., Hiver & Larsen-Freeman, 2020; Larsen-Freeman & Cameron, 2008)—scholars have acknowledged the methodological and statistical challenges involved in researching such relational systems (see, e.g., Dörnyei *et al.*, 2015; Hiver & Al-Hoorie, 2019; Hiver & Papi, 2019). Joining continuing efforts to help bridge theory–method gaps, the present study provides a first application of psychological network modeling for exploring HL learners’ motivational profile.

Background

In the United States educational context, the term “HL learner” generally refers to an early bilingual English-dominant individual raised in a home or community setting where another language, such as Spanish, was spoken. Despite being native speakers of their respective HLs, HL learners tend to differ significantly from other native speakers in how much they speak, understand, and engage with their HL at home and/or in their community (e.g., Rothman & Trelles-Daller, 2014; Valdés, 2001). Furthermore, HL learners have often received limited formal academic instruction in the HL by the time they reach postsecondary education. Additionally, it is not uncommon for HL learners to display low linguistic self-esteem (e.g., Potowski, 2002) and to experience feelings of judgment when using their home language in classroom settings (e.g., Schreffler, 2007). They may also exhibit linguistic practices that do not follow prescriptive standard language norms, including contact phenomena (e.g., borrowings, semantic extensions) that are common among US-born bilinguals (e.g., Leeman, 2005, 2015), and that are sometimes misconstrued in academic contexts as indicators of low HL proficiency (e.g., Bayram *et al.*, 2021; Lynch, 2012).

Of relevance to this study, although intra- and intergenerational minoritized language loss is still commonplace today, many HL learners are seeking to maintain their HL and pursue formal HL study in postsecondary contexts (e.g., to strengthen connections with their familial heritage and community, for career advancement purposes; see Carreira & Kagan, 2011). Indeed, Spanish HL speakers constitute a rapidly growing population in language classrooms across the United States, further highlighting the need to understand their motivational profile in these contexts. With this in mind, the present study sought to explore interconnections among Spanish HL learners’ possible HL selves, family influence, motivated behavior, achievement goal orientations, HL emotions, perceived classroom environment, and critical language awareness.

Possible HL selves and motivated behaviors

Dörnyei’s (2009) L2 Motivational Self System comprises the most dominant theoretical framework in the study of language-learning motivation. Dörnyei reformulated the construct of language-learning motivation as arising from learners’ perceived association between their current and future self-concepts. Based in part on emerging theories in motivational psychology, the assumption is that a desire to bridge the gap between one’s actual and future L2 selves drives motivated learning behavior in pursuit of L2 achievement. L2 motivation is thus conceptualized from an individual-centered

sociodynamic perspective, wherein motivated behavior arises from a network of psychological variables that are in constant interaction with each other and the learning context (e.g., Dörnyei, 2009; Ellis & Larsen-Freeman, 2009; Hiver & Larsen-Freeman, 2020; Larsen-Freeman & Cameron, 2008).

The L2 Motivational Self System comprises three components—namely, the ideal L2 self, the ought-to L2 self, and the L2 learning experience. The ideal L2 self represents one's L2 aspirations and hopes, including the attributes one desires to have as an L2 speaker. The ought-to L2 self represents one's L2 expectations, duties, and obligations, as well as the qualities that one believes one should have as an L2 speaker. The third component, L2 learning experience, refers to situated motives concerning the learning environment. A vast amount of research has sought to elucidate the motivational distinctions of the ideal and ought-to L2 selves by investigating their connections with motivated language-learning behavior. To this effect, prior research has predominantly considered learners' intended effort (i.e., the amount of effort willing to invest into L2 learning) as a criterion variable. Both the ideal and ought-to L2 selves have been found to contribute to intended effort, although the ideal L2 self generally explains a greater amount of variance across studies (e.g., Dörnyei & Chan, 2013; Dunn & Iwaniec, 2021; Moskovsky et al., 2016; Teimouri, 2017; You et al., 2016; see also Papi, Bondarenko, et al., 2019; Papi & Khajavy, 2021, for an updated model bifurcating the L2 selves into own/other standpoints). Recent work by Hiver and Al-Hoorie (2020) indicates that intended effort is best conceptualized as a predictor variable, rather than a criterion variable, of the ideal and ought-to L2 selves, highlighting the complex reciprocal relationships that can anchor these factors.

Although the constructs of the ideal and ought-to selves have been validated across several L2 and FL contexts (see Dörnyei & Ryan, 2015), their relevance and applicability in HL contexts remains somewhat unexplored. Indeed, despite growing interest in understanding the motivational experiences of HL learners, limited research has considered HL learners' motivation from the perspective of the motivational self-system. Focused on Japanese HL learners in Australia, Kurata (2015) found that HL learners' motivational selves were dynamic and emerged through their learning experiences and external pressures from different communities. Data from questionnaires and focus group interviews also suggested that HL learners experienced lower self-confidence and less willingness to interact with highly proficient Japanese speakers, in part due to the discrepancy they observed between their perceived HL competence and that ascribed by others.

In a more recent study, Torres et al. (2019) investigated how a series of background and socioaffective individual differences, including learners' HL motivation, influenced Spanish HL learners' achievement. They found that learners' motivation—conceptualized following Dörnyei's model—and willingness to communicate in the HL were positively related to their performance in a grammaticality judgment task. As noted by Torres et al., their findings suggested that Dörnyei's (2009) model could provide a promising theoretical avenue for understanding Spanish HL learners' motivation.

A different study by Smith and Li (2020), centered on Chinese HL learners between the ages of 10 and 18, considered the influence of the ideal HL self on learners' intended classroom effort alongside students' attitudes and perceptions toward the HL. The ideal HL self positively predicted motivated behavior, albeit the variance explained was relatively small. Some dimensions of the ideal HL self were also rated higher among older teenagers than among younger children. Although this study highlights the relevance of the ideal HL self in influencing language-learning behavior, the contributions of the ought-to HL self were not considered, so the motivational force associated with students' beliefs about their HL aspirations in this respect remains to be

investigated. Building on this emerging scholarship, the present study explores the relevance of the self-guides for HL learner populations more explicitly by considering their connections within a complex network of psychological variables, including intended HL learning effort.

HL achievement goal orientations

Achievement goal theory assumes that individuals have different objectives for pursuing learning activities. Goal orientations are viewed as a critical component of learners' experience in the classroom, playing a role in regulating cognition, behavior, and emotions (Elliot, 2005). Most accounts distinguish two broad types of goal orientations that learners may adopt based on their focus of competence (see Elliot & Hulleman, 2017): A mastery goal orientation entails a tendency to focus on developing knowledge and abilities, whereas a performance goal orientation entails a tendency to focus on demonstrating one's knowledge and skills relative to others. Recent expansions have also added the valence of competence as an additional dimension to consider in performance goal orientations—namely, distinguishing between a focus on approaching success versus avoiding failure (e.g., Elliot & Harackiewicz, 1996; Korn & Elliot, 2016). Mastery and performance goal orientations also tend to be accompanied by different standards of competence (see Korn & Elliot, 2016): Learners with high mastery goal orientations are likely to evidence an intrapersonal criterion in which the standard is the task/self; in contrast, learners with high performance goal orientations are likely to hold an interpersonal criterion in which the standard is others' relative competence.

In the L2 domain, Woodrow (2006) suggested that a mastery goal orientation is associated with effort and persistence in language learning, whereas a performance goal orientation is linked to language-learning anxiety. More recent work has also explored connections between L2 learners' achievement goal orientations and L2 mind-sets (i.e., beliefs regarding the malleability of language intelligence), among other variables (e.g., Lou & Noels, 2017; Papi, Rios, et al., 2019). For instance, Papi, Rios, et al. (2019) investigated the relationship between L2 learners' achievement goal orientations and their feedback-seeking behavior, as well as the extent to which such orientations mediated the association between learners' L2 mind-sets and their feedback-seeking behavior. A mastery-approach goal orientation predicted L2 feedback monitoring and partially mediated the relationship between growth L2 mind-set and feedback monitoring. Only L2 learners with a mastery-approach goal orientation tended to pay attention to corrective L2 feedback and saw it as providing opportunities for advancing their L2 skills.

In summary, achievement goal theory can offer a useful framework from which to explore how HL learners' goal orientations are associated with other primary motivational variables in postsecondary classroom contexts. The present study explores connections among HL mastery and performance goal orientations and HL learners' motivational, emotional, and behavioral dispositions toward the HL.

Positive and negative HL emotions

Research on the psychology of language learning has also increasingly considered the role of primary emotions in L2/FL learners' motivational tendencies and language achievement (e.g., Khajavy et al., 2018; MacIntyre & Vincze, 2017; Papi & Khajavy,

2021). Both positive and negative emotions have been recognized as important in learners' engagement, performance, and overall well-being in academic contexts (Pekrun et al., 2009). Although anxiety remains the most widely studied negative emotion to date, a growing body of work has begun to address the role of positive emotions, such as L2/FL enjoyment (Dewaele & MacIntyre, 2014).

Accumulated findings suggest that L2/FL anxiety is negatively associated with L2/FL achievement and motivated L2/FL behaviors, including willingness to communicate in the target language (e.g., Khajavy et al., 2018; Papi & Khajavy, 2021; Peng & Woodrow, 2010). In contrast, evidence suggests that L2/FL enjoyment is associated with enhanced learner motivation, promoting L2/FL outcomes as well as behavioral dispositions that support successful language learning (e.g., Khajavy et al., 2018; Teimouri, 2017). Research exploring the connection between L2/FL anxiety and enjoyment has also shown that although these emotions can often be negatively related, their association tends to be of small magnitude, which suggests that anxiety and enjoyment should not be conceptualized as opposite ends of the same construct (see, e.g., Dewaele & MacIntyre, 2014).

To date, quantitative research considering emotions among HL learner populations is rather limited and has centered on HL anxiety. With a focus on Spanish, recent work by Prada et al. (2020) found that HL anxiety was lower among college-age HL learners enrolled in HL-specific (i.e., tailored) courses relative to those enrolled in traditional FL courses. Earlier research by Tallon (2009) also suggested that HL learners are likely to experience decreased levels of anxiety compared with FL learners in postsecondary classroom contexts, particularly in lower-level language courses. The present study expands this line of inquiry by considering the relevance of both HL anxiety and enjoyment in connection with HL learners' motivational and behavioral dispositions in postsecondary contexts.

Classroom environment

Following an ecological perspective of education, an increasing number of studies have examined L2 motivational dispositions in conjunction with classroom contextual variables. Such an approach follows from the assumption that classroom dynamics are strongly influenced by and have an effect on the educational environment cobuilt by individual learners' perceptions (see Peng & Woodrow, 2010). Research findings suggest that L2 learners' behaviors are largely affected by perceived environmental factors in the immediate classroom context, including factors associated with their instructor and L2 peers (e.g., Khajavy et al., 2018; Peng, 2012; Peng & Woodrow, 2010).

Recent quantitative L2 studies have predominantly examined the notion of classroom environment as it relates to the three most salient components we can find in any given classroom—namely, the teacher, the tasks, and the learners. These components have been conceptualized as perceived teacher support, student cohesiveness, and task orientation, following proposals in educational theory (see, e.g., Fraser, 1998). Teacher support corresponds to the degree to which instructors help, encourage, and show interest toward students. Task orientation captures the extent to which it is important to stay on task along with the perceived usefulness of class activities. Lastly, student cohesiveness refers to how much learners know, help, and support each other in class. Of relevance to this study, perceived classroom environment has been shown to directly influence L2 learners' behavior, such as through their willingness to communicate in the L2 (e.g., Khajavy et al., 2018; Peng & Woodrow, 2010). An engaging educational

environment—as reflected by teachers’ support, meaningful learning tasks, and strong student cohesiveness—is assumed to promote dispositions that positively affect learning.

As noted, unlike L2 learners, many HL learners may have little to no prior experience in learning Spanish in classroom contexts by the time they reach postsecondary education. Beyond serving as a platform for communicative interaction in the minority language, the classroom environment is significant to the extent that it may influence how HL learners perceive themselves linguistically, culturally, and socially.

Critical language awareness

Critical language awareness has received growing attention as a central element of HL teaching practices (e.g., Beaudrie *et al.*, 2019; Lowther-Pereira, 2015; Loza & Beaudrie, 2022). Following an increasingly recognized need to address the sociolinguistic and sociopolitical issues encompassing language in HL education, efforts have been made to promote pedagogical approaches that appraise HL speakers’ linguistic varieties, value the knowledge they bring from their homes and communities, and foster students’ critical awareness of language variation and the ideologies and power relations present in discourse (e.g., Leeman, 2005; Leeman *et al.*, 2011; Leeman & Serafini, 2016).

To a great extent, proposals supporting critical language awareness have surged as a response against traditional deficit-based pedagogies that privilege an idealized monolingual-centric prescriptive language variety and systematically portray HL speakers’ nonstandard language practices as illegitimate and incorrect. It is reasonable to assume that such pedagogical practices that elevate a so-called monolingual prescriptive standard and represent HL learners’ linguistic uses as deficient can adversely affect students’ linguistic self-image and motivation to seek further language study in pursuit of HL maintenance (e.g., Leeman, 2005, 2015; Lowther-Pereira, 2015). Against this background, and increasingly so, critical language awareness is viewed as a central component for breaking down dominant language ideologies while promoting HL speakers’ empowerment in challenging the subordination of their language practices.

In a recent study, Beaudrie *et al.* (2019) sought to develop and validate a questionnaire to measure critical language awareness in classroom contexts among HL speakers of Spanish in the US. The questionnaire contained Likert-type scale items referring to various aspects associated with critical language awareness, including attitudes toward language variation, linguistic prejudice, and English and hegemonic language ideologies, as well as bilingualism, Spanglish, and code-switching. Based on data gathered from university-level Spanish HL learners, Beaudrie *et al.* concluded that learners who are critically aware are “cognizant of the naturalness of language variation and its loading of social, political, and economic power structures, while accepting the intrinsic value of their own bilingual varieties and all others” (p. 585). Although the initial questionnaire also included items related to maintenance and advocacy toward HLs, the authors noted that these items showed inadequate reliability and that further research is needed to validly assess the behavioral aspects that may be associated with critical language awareness.

In all, critical language awareness has been identified as a central factor associated with HL learners’ attitudes and motivational dispositions toward the HL, although empirical research investigating these connections is still lacking. The present study takes a first step at examining the relevance of critical language awareness for

understanding Spanish HL learners' motivational tendencies in postsecondary classrooms from a quantitative perspective.

Psychological network modeling of complex systems

Complexity perspectives are recognized as providing the prime epistemological basis for advancing research on language-learning motivation (see, e.g., Dörnyei & Ushioda, 2009; Hiver & Larsen-Freeman, 2020; Hiver & Papi, 2019). Today, it is well assumed that motivational phenomena do not occur in isolation but are instead embedded in and affected by an ecosystem of multiple, interconnected individual and contextual factors that are in a state of continual emergence. Although these conceptual developments in L2 motivation theory are well established, empirically researching and capturing such complexity, interconnectedness, and nonlinear dynamism (particularly from a quantitative perspective) can be methodologically challenging (e.g., Hiver & Al-Hoorie, 2019; Hiver & Papi, 2019). Of note, common statistical techniques that assume linearity and component-dominant unidirectional causation (i.e., that variable X influences variable Y and not vice versa and that one variable can change without everything else changing) may not be useful for understanding system-level interdependencies in ever-changing, complex dynamic phenomena.

Outside the second-language-acquisition (SLA) field, several voices have argued that, under the assumptions of a complex systems perspective, the most informative, theory-aligned approach to quantitative data analysis may not entail “the a priori imposition of a latent variable structure” but rather “the construction of a network that represents the most important relations between variables” (Constantini et al., 2015, p. 14). Such an approach would provide insight into emergent interactions, feedback structures, and overall connectivity within the focal psychological ecosystem under investigation. Psychological network models have been recognized as a flexible statistical tool to attain this goal (e.g., Borsboom & Cramer, 2013). These models conceptualize variables as part of a complex system of interconnected nodes and have been increasingly adopted in various disciplines, including psychology (see Borsboom et al., 2021, for an overview), due to their utility in elucidating relationships of mutual influence among variables. Network models have also gained popularity for their usefulness as exploratory hypothesis-generating models (Epskamp et al., 2016, 2017). Given its potential, it is not surprising to see that network analysis has recently caught SLA researchers' interest (see the SSLA Methods Forum by Freeborn et al., 2022, for an introduction to cross-sectional network modeling).

From a computational standpoint, the network analysis technique illustrated here takes dependencies into account by establishing conditional associations between variables. Unlike regression models, network models establish prediction and multicollinearity among all variables (Epskamp & Fried, 2018). However, unlike some types of structural equation modeling, network models estimate unique variance while retaining shared variance across all variables (Constantini et al., 2015).¹ The technique functions under a “mutualism” model in which structural covariance stems from emerging interactions between observed variables that mutually “incite” or

¹The reader is directed to Abacioglu et al. (2019) for a more detailed comparison of the differences between network models and structural equation and multiple regression models (see also Epskamp et al., 2017, 2018).

“inhibit” each other within the system. Thus, network analysis is well suited for investigating multifaceted interactions within a high-dimensional system of interconnected variables, in line with complexity perspectives (e.g., Borsboom & Cramer, 2013; Epskamp *et al.*, 2017). For instance, the mutualism model is congruent with the notion of reciprocal causality (Larsen-Freeman & Cameron, 2008) characterizing complex systems like language-learning motivation, which assumes that every component in a system affects every other component, contributing to the behavior of the whole system.

A network model consists of nodes (observed variables) and edges (lines representing statistical relationships among variables) representing a complex system. The size and density of edges correspond to the strength of the association among nodes. Two nodes that are not associated after conditioning on other nodes are considered independent. Along with the network structure, centrality indices can be computed to assess the role and dominance of individual nodes within the network. The stability of networks and centrality indices can also be calculated using bootstrapping procedures (for further information, see Freeborn *et al.*, 2022). We direct the reader to Borsboom *et al.* (2021) for a recent overview of network analysis in psychological science.

Here, we sought to explore the potential of this novel modeling technique for advancing our understanding of Spanish HL learners’ motivational profile as a complex system. As highlighted in our review, given that theoretical developments regarding HL motivation are still incipient, psychological network modeling was deemed particularly appropriate for laying effective exploratory groundwork from which to advance further empirical investigations focused on this learner population.

The current study

The primary goal of this study was to examine the complex network comprising a set of psychological factors posited to play a role in HL motivation: the possible HL selves, family influence, intended HL learning effort, HL achievement goal orientations, HL emotions, perceived classroom environment, and critical language awareness. To this end, patterns of connections and interdependencies among constituent variables were estimated using psychological network modeling. The following questions guided the analysis: (a) What is the psychological network structure associated with Spanish HL learners’ motivational profile? (b) What are the most central variables in the psychological network structure? and (c) How stable is the psychological network structure?

Method

Participants

Data were gathered through an online questionnaire, which was shared with Spanish HL learners enrolled in Spanish courses in four US universities in the states of Texas, Florida, Pennsylvania, and Oregon. Using snowball sampling, data were also collected from additional public and private universities across the US by sending calls for participation through emails to colleagues, who were invited to share the open-access survey with students and other instructors. This combined approach was adopted in an effort to maximize the representativeness of our heritage learner sample across various geographic and institutional contexts in the US.

Table 1. Percentage of time spent using Spanish and English in an average week

	Spanish		English	
	<i>M (SD)</i>	Min-Max	<i>M (SD)</i>	Min-Max
With friends	15.17 (19.47)	0–100	86.36 (17.02)	0–100
With family	56.79 (29.27)	0–100	47.80 (27.94)	0–100
At school/work	24.50 (18.58)	0–100	78.47 (15.74)	20–100

Note. Language use questions were adapted from Birdsong et al. (2012).

The final sample included 209 participants who identified as HL learners of Spanish.² A total of 155 respondents identified as female, 53 identified as male, and one chose the “other/prefer not to say” option. Participants were around 20.69 years of age ($SD = 2.52$; Min–Max = 18–39). Their mean age of acquisition of Spanish and English was 0.41 ($SD = 1.18$; Min–Max = 0–6) and 2.57 ($SD = 3.10$; Min–Max = 0–16) years old, respectively. Thirty participants reported functional knowledge of at least an additional nonprimary language (e.g., ASL, French, Portuguese). Participants also indicated that they had completed an average of 4.74 years ($SD = 3.89$; Min–Max = 0–20) of prior coursework in Spanish. Last, they reported their frequency of Spanish and English use with friends, with family, and at school/work in an average week (see Table 1).

Scales

Possible selves

To assess learners' ideal HL self and ought-to HL self, eight Likert-type scale items selected from Taguchi et al. (2009) were adapted for HL learners of Spanish (see Appendix S1 in the Online Supplementary Materials for all scale items). Items tapping into each self-guide construct were chosen considering their relevance and applicability for HL speaker populations (e.g., items such as “I can imagine myself speaking Spanish as if I were a native speaker of Spanish” were deemed incongruous for this population; see, e.g., Rothman & Treffers-Daller, 2014).

Family influence

Additionally, six Likert-type scale items measuring family influence dimensions were selected from Taguchi et al. (2009). For purposes of the current study, we deemed it important to include items that specifically tapped into familial pressure because HL

²Respondents included in this study self-identified as Spanish HL speakers by responding affirmatively to the question “Are you a heritage speaker of Spanish? (note: for this study, a ‘heritage speaker’ is described as someone who grew up in a home where Spanish was spoken).” The questionnaire was anonymous, except for one institution where it was administered under a different Institutional Review Board protocol and where identification occurred as students were placed into the Spanish for HL speakers program. Ten participants who did not report an early age of exposure to Spanish (≤ 6 years old), and one participant who completed their primary and secondary education in Spanish and began learning English at university (at 18 years old) were excluded from the present analysis. Although HL learners are recognized as a vastly heterogeneous population and the definitional features of who HL speakers are remain contested (see Ortega, 2020), these selection criteria were applied to identify participants with linguistic and/or educational experiences that differed meaningfully from the sample majority in an effort to reduce bias in sample selection.

speakers are continuously exposed to attitudes and expectations about their language practices at home (e.g., Beaudrie *et al.*, 2019; Bernal-Henríquez & Hernández-Chávez, 2003).

Intended effort

Following prior research in the domain of language-learning motivation, HL learners' intended effort toward learning Spanish was measured by adapting six Likert-type scale items from Taguchi *et al.* (2009).³

Achievement goal orientations

To measure achievement goal orientations, 12 Likert-type scale items from Papi, Rios, *et al.* (2019), modified from Korn and Elliot's (2016) scales to be L2 specific, were adapted for learners of Spanish. Six items were included for each focal standpoint of competence (mastery or performance), with half of the items in it varying by valence (approach or avoidance).

HL enjoyment and anxiety

To tap into positive and negative emotions toward the HL, we employed 10 Likert-type scale items on HL enjoyment and eight Likert-type scale items on HL anxiety from Dewaele *et al.* (2019; adapted from Dewaele and MacIntyre, 2014, and Horwitz *et al.*, 1986, respectively).

Classroom environment

Perceived classroom environment was measured using 13 Likert-type scale items adapted from Peng and Woodrow (2010). Four items measured teacher support, five items measured task orientation, and four items tapped into student cohesiveness.

Critical language awareness

Critical language awareness was measured using 11 items from Beaudrie *et al.* (2019). Selected items referred to students' attitudes on topics related to language variation, linguistic diversity, Spanish in the US, bilingualism, and code switching. The scale sought to tap into students' beliefs toward the naturalness of language variation and their appreciation toward the inherent value of bilinguals' language practices.⁴ We were particularly interested in assessing students' beliefs surrounding the language uses of Spanish-English US bilinguals, as HL learners often internalize the negative views that are sometimes portrayed by educators, curricular programs, and teaching materials toward nondominant varieties like US Spanish (e.g., Bernal-Henríquez & Hernández-Chávez, 2003). All items were reverse-coded so that higher ratings were indicative of stronger critical language awareness.

³We focus here on intended effort because, unlike other measures (e.g., willingness to communicate), it substantiates motivated learning behavior in support of instructed HL development in classroom contexts and thus was deemed particularly informative for our study and sample.

⁴Behavioral items were not included due to the lower reliability reported in Beaudrie *et al.* (2019).

Internal consistency

Internal consistency coefficients, calculated using Cronbach's α , indicated good reliability across all scales and subscales: Ideal HL Self, $\alpha = .821$; Ought-to HL Self, $\alpha = .836$; Family Influence, $\alpha = .883$; Intended Effort, $\alpha = .892$; Mastery Goal Orientation, $\alpha = .866$; Performance Goal Orientation, $\alpha = .903$; HL Enjoyment, $\alpha = .890$; HL Anxiety, $\alpha = .863$; Classroom Environment, $\alpha = .924$; and Critical Language Awareness, $\alpha = .852$.

For each scale and subscale, we also performed exploratory factor analyses and estimated the intraclass correlation coefficients associated with classroom- and school-level variation, which we report in [Appendices S2](#) and [S3](#) in the Online Supplementary Materials, respectively, for the reader's interest. Standardized mean scores for each scale and subscale were employed in subsequent analyses (descriptive statistics are summarized in [Appendix S4](#) in the Online Supplementary Materials).

Analysis

To address the first analytical question and examine the complex structure of HL learners' motivational profile, we modeled our data into an exploratory regularized partial correlation network (Epskamp et al., 2017, 2018; Epskamp & Fried, 2018). To address the second question, we computed centrality measures for each node regarding its importance in connecting other nodes to each other, closeness to other nodes, and connection strength. Last, to address the third question, we applied bootstrapping procedures to analyze the stability and robustness of the network edges and centrality indices.

Results

Psychological network analysis

Network estimation

To estimate the scale-level network structure of the 10 variables of this study, we employed the *EBICglasso* procedure from the *qgraph* R-package in JASP (JASP Team, 2019), which computes the sparse inverse covariance matrix using the *graphical* least absolute shrinkage and selection operator (LASSO) regularization in combination with the extended Bayesian information criterion (EBIC).⁵ This modeling function builds a parsimonious network that accounts for the largest amount of variance with the fewest number of parameters, preventing overfitting, and is recommended for smaller samples (Epskamp et al., 2017, 2018). The tuning parameter controlling the level of sparsity was set to 0.5 (the default in JASP), which is claimed to provide a good balance between minimizing the number of spurious edges and maximizing the extraction of true edges (see Epskamp & Fried, 2018; Hevey, 2018 for a discussion). [Figure 1](#) shows the resulting plot, with blue and red lines representing positive and negative edges, respectively.⁶ Edge weights are summarized in [Table 2](#).

⁵Network structures can be estimated at different levels of aggregation, including specific items in a scale (see Borsboom et al., 2021). A scale-level network was computed in this study in light of our modest sample size and exploratory research goal.

⁶Estimating the *EBICglasso* regularized network model after applying a nonparanormal transformation (Liu et al., 2009) on the continuous data in JASP yielded an almost equivalent network structure (see [Appendix S6](#) in the Online Supplementary Materials).

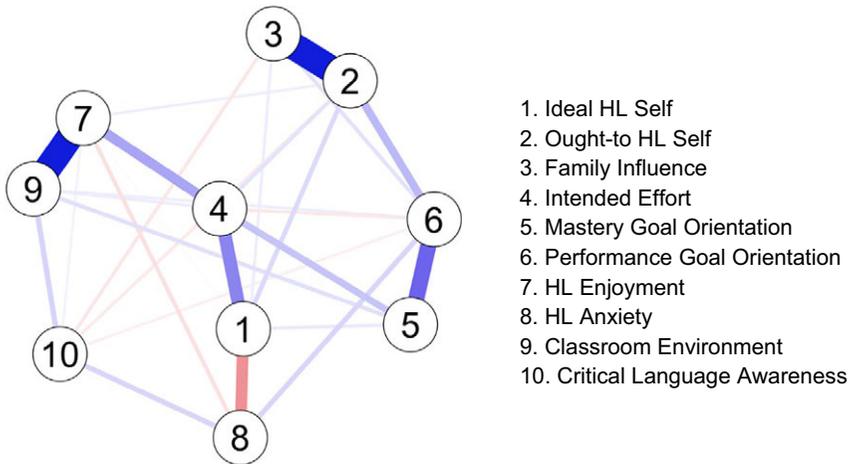


Figure 1. EBICglasso regularized network model of the ten focal variables of the study.

Table 2. Psychological network model: Weights matrix

Variable	Network								
	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Ideal HL Self	–								
2. Ought-to HL Self	.10								
3. Family Influence	.00	.69	–						
4. Intended Effort	.32	.07	.00	–					
5. Mastery Goal Orientation	.06	.00	.00	.15	–				
6. Performance Goal Orientation	.00	.18	.08	–.06	.40	–			
7. HL Enjoyment	.01	.04	.01	.24	.00	.00	–		
8. HL Anxiety	–.28	.00	.05	.00	.00	.11	–.08	–	
9. Classroom Environment	.00	.00	.00	.05	.08	.05	.68	.00	–
10. Critical Language Awareness	.00	–.06	–.06	.00	.00	–.04	.03	.11	.11

Note. Nodes: 10. Number of nonzero edges: 28/40. Sparsity: .38.

The analysis returned a network with a majority of positive associations among nodes. Most negative edges are weak in strength. Intended Effort shows strong links to Ideal HL Self and HL Enjoyment, as well as moderate positive associations with Mastery Goal Orientation and Ought-to HL Self, respectively. HL Anxiety has a negative connection with the Ideal HL Self, but not the Ought-to HL Self, which is very strongly connected with Family Influence. In contrast, HL Enjoyment, which has a direct link to Intended Effort, is also strongly connected with Classroom Environment. Additionally, differential associations are observed between HL learners’ achievement goal orientations and their possible selves upon conditioning on all other nodes: Ideal HL Self is directly connected with Mastery Goal Orientation but is independent of Performance Goal Orientation, whereas the opposite is true for the Ought-to HL Self. Family Influence shows a weak positive association with Performance Goal Orientation. There is no direct edge connecting Critical Language Awareness and Intended Effort, but indirect connections through other nodes are apparent. Specifically, Critical Language Awareness has weak positive connections with Classroom Environment and HL

Anxiety, and negative connections with Family Influence, Ought-to HL Self, and Performance Goal Orientation.

Centrality metrics

A centrality analysis was subsequently computed to assess the importance of each node in the network using three standard indices: (a) *betweenness*, which indicates the frequency with which a node sits within the shortest path between two other nodes; (b) *closeness*, which shows how distanced a node is from all other nodes; and (c) *strength*, which signals the absolute number of connections to a node and how robust they are (see, e.g., Abacioglu et al., 2019; Hevey, 2018).⁷ Strength is a metric of direct connectivity, whereas between and closeness are considered metrics of indirect connectivity.

Results, summarized in Table 3, reveal that Intended Effort and Ideal HL Self are associated with the largest betweenness and closeness scores, which suggests that these nodes have the greatest influence on the overall structural dynamics of the network, as a lot of information flows through them. In contrast, the Ought-to HL Self along with HL Enjoyment evidence the highest strength centrality scores, which indicates that these nodes have the densest connections with other nodes in the network. Critical Language Awareness, HL Anxiety, and Family Influence featured the lowest centrality scores overall, suggesting that these nodes are less easily affected by changes in other network constituents and play a more peripheral role in network dynamics.

Stability analysis

Before assessing network stability, or the extent to which “interpretation remains similar with less observations,” we estimated its accuracy, or the extent to which it is

Table 3. Centrality measures by node

Variable	Network		
	Betweenness	Closeness	Strength
Ideal HL Self	1.13	1.36	-.30
Ought-to HL Self	.31	-.77	1.38
Family Influence	-.93	-1.15	.18
Intended Effort	1.96	1.47	.24
Mastery Goal Orientation	-.31	.37	-.65
Performance Goal Orientation	-.51	.37	.34
HL Enjoyment	.72	.09	1.13
HL Anxiety	-.72	.30	-.97
Classroom Environment	-.51	-.46	.61
Critical language awareness	-1.13	-1.58	-1.94

⁷ It is worth noting that JASP also provides information on each node's *expected influence* (Robinaugh et al., 2016), a relatively novel centrality metric that is estimated like *strength*, but without taking the absolute value of edge weights before summing them. Although *expected influence* is increasingly reported in cases in which networks have both positive and negative edges, it is only appropriate when such positive and negative edges can be interpreted as canceling each other out (see Deserno et al., 2022), as is common in many symptomatology networks. We did not consider it here because the interpretation of the scales of the nodes is not the same for every node in the network.

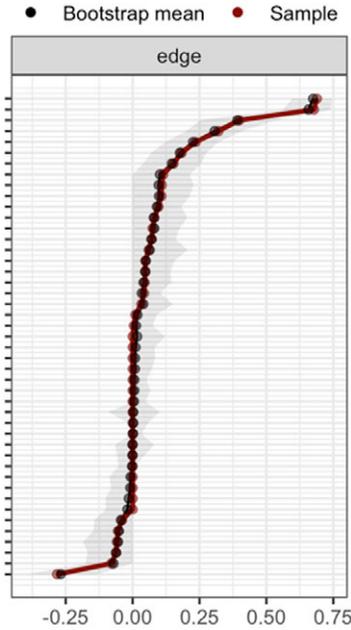


Figure 2. Nonparametric bootstrapped edge weights (ordered from highest to lowest), with 95% CIs depicted as grey area. Note. The y-axis labels have been omitted to avoid cluttering.

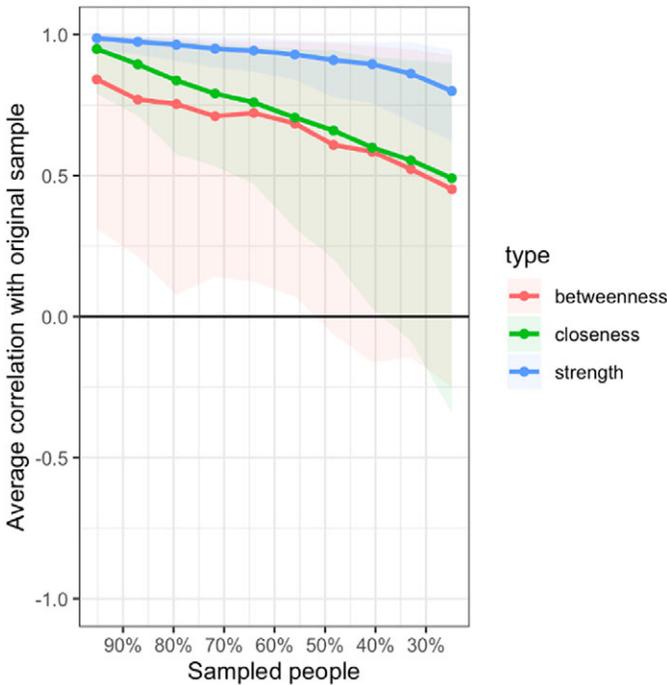


Figure 3. Bootstrap analysis showing correlations between centrality indices of reduced and original samples (colored fields show the 2.5th–97.5th percentile values of the correlations).

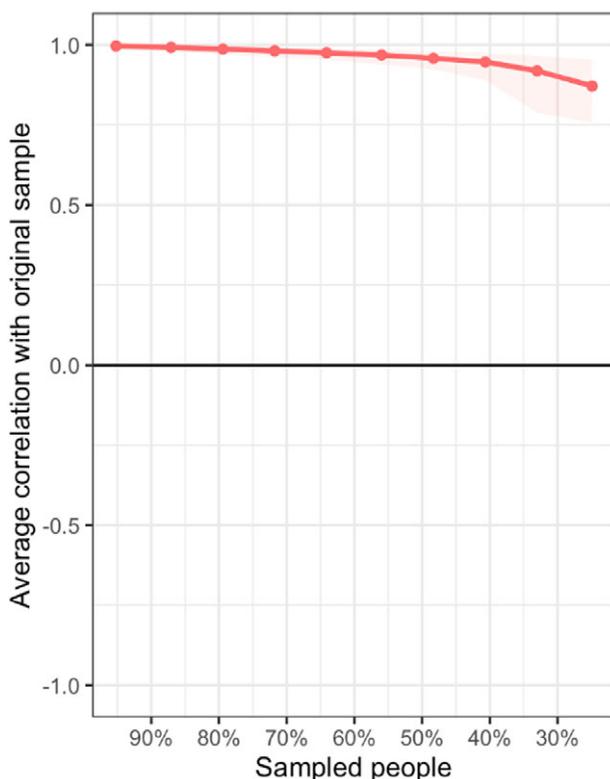


Figure 4. Bootstrap analysis of edge weights and corresponding 95% CIs.

“prone to sampling variation” (Epskamp et al., 2018, p. 195). Both were computed with bootstrap analyses (5,000 replications) using the *bootnet* R-package in JASP. We performed nonparametric bootstraps with 95% confidence intervals (CIs) to examine edge weight accuracy, as summarized in Figure 2 (see Appendix S6 for figure with populated y-axis). Smaller CIs are indicative of more accurate parameter estimates. Most CIs are modestly narrow, considering our sample size and the number of network nodes. Nonetheless, some parameters, such as the weaker edge weights linked to Node 10 (Critical Language Awareness), evidence wider CIs, indicating that they are more susceptible to sampling variation and should be interpreted more cautiously.

To check the stability of centrality metrics, we followed the case-drop bootstrap procedure (Epskamp et al., 2017, 2018), which reestimates the network model for various proportions of cases (i.e., participants in the data set) in an iterative manner. The magnitudes of the correlation between the original indices and those obtained from fractions of the data are compared, with higher values indicating better estimate stability. As illustrated in Figure 3, strength centrality shows relatively large (>.50) correlation magnitudes for even a sample of 30% of the original data set. In contrast, closeness, and especially betweenness, evidence smaller correlations across fractions of the data, an instability pattern that is not uncommon in network analysis (see Epskamp et al., 2017). We focus our subsequent inferences primarily on the metrics of strength and closeness, interpreting the latter more cautiously, as indicators of direct and indirect connectivity, respectively.

Lastly, we also calculated the stability of edge strengths using the case-drop bootstrap procedure, as shown in Figure 4. Even for a sample of 30% of the original sample, the edge weight estimates are quite strongly correlated to the estimates computed for the whole sample.

Discussion

This study sought to provide a first exploratory application of the psychological network modeling technique in the domain of HL learning motivation. Results revealed a relatively sparse system with a majority of positive edges. The stability analyses performed through the bootstrapping procedures further showed that the estimated model was relatively robust, particularly with respect to strength centrality and the order of edge weights. Several theoretically relevant patterns of connectivity were observed, providing novel insights into potential important associations among motivational variables for this underexplored learner population.

Possible HL selves, achievement goal orientations, and motivated behavior

Salient positive connections emerged between Intended Effort and the Ideal HL Self and a Mastery Goal Orientation. Although less prominently, Intended Effort was also positively linked to the Ought-To HL Self and negatively associated with a Performance Goal Orientation. Overall, results align well with previous studies conducted in both HL and L2/FL formal contexts that have reported beneficial motivational roles for learners' possible HL/L2/FL self-guides, particularly for the ideal self (e.g., Dunn & Iwaniec, 2021; Kurata, 2015; Papi, 2010; Smith & Li, 2020; Teimouri, 2017). Although Smith and Li (2020) also found that the ideal HL self was positively associated with intended effort to learn the HL (Chinese) in primary/secondary school, the explained variance was relatively low, a result they proposed may be related to the prevalence of language-learning opportunities outside of class (i.e., in family/community contexts). Here, the connection observed between the ideal HL self and intended effort in postsecondary school contexts was relatively strong. This underscores the reciprocal effects between a prominent ideal HL self and college-level Spanish HL learners' investment of time and energy into HL learning as they advance toward their desired language-related goals. The less prominent role evidenced for the ought-to HL self further suggests that seeking to meet externally set HL expectations is less strongly connected with pursuing HL learning behaviors. Our findings also indicate that a mastery goal orientation is likely tied to effort expenditure and persistence in HL learning in support of longer-term development (e.g., Kaplan & Maehr, 2007); in contrast, a performance goal orientation appears more likely to match with an outcome-oriented perspective, driven by a desire for external validation, that may not be as conducive to sustained classroom-learning efforts (e.g., Korn & Elliot, 2016).

Of note were also the divergent connections observed among HL learners' achievement goal orientations and their possible selves: although a performance goal orientation in the Spanish class connected positively with the ought-to HL self and family influence, it showed no direct pathway to the ideal HL self after conditioning on all other variables, whereas the opposite was true for a mastery goal orientation. These findings fit well with the substantive amount of educational research that has reported consistent positive associations between a mastery goal orientation and high student engagement, positive self-perceptions, and academic achievement (e.g., Daniels *et al.*,

2008; Woodrow, 2006). Indeed, HL learners' internalized desire to reach their future image as highly proficient bilinguals can provide a commutual impetus for endorsing a development approach directed at advancing their HL skills and knowledge in their Spanish class. In contrast, HL learners with a more pronounced future self representation of the HL obligations and duties expected by others and with a greater inclination toward feeling externally imposed pressures for studying their home language in formal contexts are more prone to endorsing a performance goal orientation directed at demonstrating relative Spanish ability and outperforming peers. This pattern of results aligns well with the assumption that goal orientations constitute a fundamental component of learners' possible selves to the extent that they comprise consistent behavioral and cognitive dispositions linked to how students approach their future aspirations and respond to academic demands (e.g., Dweck, 1986; Oyserman et al., 2004).

The centrality analysis further indicated that Intended Effort and the Ideal HL Self were associated with the highest closeness centrality, suggesting that they are most likely to be readily affected by (direct or indirect) changes in other nodes and vice versa. In contrast, the Ought-to HL Self and HL Enjoyment were the nodes with the greatest degree of overall connectedness (i.e., strength centrality) in the network. Given that strength centrality is estimated as the sum of all absolute edge weights directly associated with a node, the high-strength centrality of the Ought-to HL Self and HL Enjoyment nodes may, to a great extent, be explained by the very strong connections they show to Family Influence and Classroom Environment, respectively. Although it is not possible to directly compare these results with prior research, it is interesting to point out some similarities with the centrality results reported in Freeborn et al. (2022), the only previous application of psychological network modeling in SLA. Reanalyzing Hiver and Al-Hoorie's (2020) data, Freeborn et al. estimated a network model using item-level information on Korean L2 English Learners' Ideal L2 Self, Ought-To L2 Self, L2 Achievement, Visual Style, and Intended Effort. The five intended effort nodes showed the highest closeness, whereas an Ought-To L2 Self node showed the highest strength, a pattern that approximates our results, despite the many methodological differences between both studies.

Central nodes, particularly those characterized by high closeness centrality, can also be relevant from a pedagogical standpoint, as changes in those statistically influential nodes can be expected to substantially affect the network structure. From this perspective, one hypothesis that arises from the present data is that motivational interventions that primarily target central nodes like Intended Effort and the Ideal HL Self (e.g., through pedagogical practices that positively promote effort investment and a clearer vision of learners' future bilingual HL selves; e.g., Hiver & Al-Hoorie, 2020; You et al., 2016) could successfully benefit or activate other nodes in the network, both directly and indirectly, promoting positive motivational and emotional experiences in the classroom. Of course, although these hypotheses appear plausible in light of current motivational theory, experimental and intensive time-series data would be needed to support inferences about the dynamic causal architecture of the system.

HL emotions and classroom environment

The present results also shed light on the relevance of HL emotions in HL learners' motivational profile. Outside the HL context, Papi and Khajavy (2021) have shown that

the possible L2 selves can result in emotional outcomes, with the ideal and ought-to selves leading to L2 enjoyment and anxiety, respectively. Here, HL Anxiety was negatively associated with the Ideal HL self, in line with some prior research in the L2 domain (e.g., Papi, 2010; Peng, 2015). This connection suggests that HL learners who are motivated by promotion-focused variables such as the ideal HL self—which may prompt them to regulate their actions with attention to positive outcomes—are also less likely to experience agitation-related emotions such as HL Anxiety. However, in contrast to some previous L2 work (e.g., Papi, 2010; Papi & Khajavy, 2021; Teimouri, 2017), HL Enjoyment was very weakly associated with the Ideal HL Self in this study and there was no direct edge connecting HL Anxiety and the Ought-to HL Self. Thus, from a network perspective, HL Anxiety and the Ought-to HL Self were modeled as conditionally independent nodes. Each node, however, was indirectly connected through multiple bridging nodes. For instance, it is likely that a stronger Ought-to HL Self will be accompanied by increased HL Anxiety through a more pronounced Performance Goal Orientation and vice versa.

Furthermore, the direct edge between classroom environment and motivated behavior was relatively weak, as this variable appeared to be linked to HL learners' intended effort to learn their home language primarily through increased HL enjoyment. Interestingly, Classroom Environment was not directly connected to HL Anxiety. In the L2 context, Khajavy *et al.* (2018) similarly found that L2 Enjoyment mediated the association between Classroom Environment and motivated behavior in the form of willingness to communicate, whereas the mediational role of L2 Anxiety was negligible. In line with their interpretation, our results suggest that classroom practices may help elevate HL learners' positive affect through shared educational experiences (e.g., Dewaele & MacIntyre, 2014) and, indirectly, bolster their HL-learning effort investment, with reciprocal effects among the two (e.g., Khajavy *et al.*, 2018; Peng & Woodrow, 2010). Together, findings underscore the importance of establishing an engaging pedagogical environment—as reflected by teachers' support, meaningful learning tasks, and strong student cohesiveness—and promoting dispositions that can positively foster HL learning in the classroom.

Critical language awareness

The network analysis also allowed for novel insights into the unexplored role of critical language awareness in HL learners' motivational profile. Results suggest that critical language awareness, as operationalized here, might not have a direct link to HL learners' intended effort to learn their home language in classroom contexts, although some indirect connections were apparent. Greater critical language awareness appears to be accompanied by more positive perceptions of the Spanish classroom—including teacher support and encouragement—and with lower familial pressure to study the HL in formal contexts. It is worth noting, however, that these connections were more unstable and relatively weak after conditioning on all other variables, so our inferences here remain tentative and in need of further evidence.

As noted, in the US, Spanish is subject to constant societal and institutional pressures that contribute to its minoritization and devaluation as a language worthy of being maintained (e.g., Beaudrie *et al.*, 2019; Loza & Beaudrie, 2022). HL learners frequently grow up exposed to attitudes and ideologies that devalue their Spanish skills and can experience judgment from their teachers and peers in the classroom (e.g., Prada *et al.*, 2020; Schreffler, 2007). In this context, some linguistic practices that

are frequently adopted by bilingual HL learners are sometimes perceived as “incorrect” and in need of being “fixed” through instruction (e.g., Leeman, 2005). It is possible that familial pressure to pursue academic study in the HL (e.g., in order to “bring honor to [the] family,” or “be an educated person,” as noted in the scale) feeds into the generally negative schemas surrounding HL speech by further promoting socialization into normative models of language use. Critical language awareness can provide HL learners with tools to confront linguistic discrimination and to understand and value the legitimacy of the language practices that characterize many US-born bilinguals, which can promote positive self-conceptualizations against external pressures from familial and academic settings. It is also likely that a more positive classroom atmosphere, where HL learners do not feel threatened or judged, contributes to nurturing their linguistic self-esteem and appreciation for the intrinsic value of their bilingual varieties.

Critical Language Awareness also showed weak connections with HL emotions. Specifically, it was positively associated with HL Enjoyment, although very weakly, and, more moderately, to HL Anxiety. Although at first glance this might seem counterintuitive, prior research has also identified other variables that are associated with increased language-learning enjoyment and anxiety simultaneously. Dewaele et al. (2016) note that “a combination of stronger positive and negative emotions in [language] learning might provide a stronger basis for motivation than would weaker emotion” (pp. 55–56). It is possible that greater critical language awareness enhances learners’ overall intensity of emotional experiences in the classroom, particularly for some facets of anxiety, which is claimed to generate “focus on the need to take specific action” (Dewaele & MacIntyre, 2014, p. 262). This may be because adopting a critical perspective also brings to the forefront internalized social pressures and lived experiences (e.g., linguistic discrimination) that may trigger negative emotional responses.

Limitations and future directions

Findings from this study should be interpreted considering its limitations. Although data were collected across multiple geographic and institutional contexts in an effort to increase the representativeness of our HL learner sample, the number of respondents was modest compared with other quantitative studies in this domain. It is worth noting that the EBICglasso estimator selected for network analysis allowed us to minimize the likelihood of type I error, as a smaller number of parameters is sufficient to compute structural covariance. Nonetheless, given that sample size is one of the main factors influencing network stability, future research should strive to collect data from larger samples to allow for strong inference around all individual network edges in addition to overall network structure. Another limitation is that the motivated behavior scale used here targeted HL learners’ intent to invest time and effort into language learning in formal contexts, in line with most prior scholarship (e.g., Taguchi et al., 2009; Teimouri, 2017), but did not purposefully consider their current motivated behavior (see Papi, Bondarenko, et al., 2019). The study also examined the motivational relevance of a two-component (ideal and ought-to) HL selves model, following most previous work in HL and L2 contexts; however, it would be valuable to explore these findings considering the more recently expanded 2×2 model of self-guides, which bifurcates the future selves by own and other standpoints (see, e.g., Papi, Bondarenko, et al., 2019; Papi & Khajavy, 2021). To this end, and in light of the manifold differences that can exist between HL and L2 learners’ compounded

bilingual experiences, it would be important to take steps in designing and validating scales that are specific to HL learners. Regarding the self-guides, for instance, items could be developed based on information elicited from HL learners themselves about their own and their significant others' aspirations and duties regarding the HL, some of which are likely to differ from those reported by L2 learners.

It is also important to consider the general methodological limitations associated with psychological network modeling, which is a relatively recent development. Similar to other methods, network models are sensitive to the variables selected by the researchers as well as the estimation methods employed (Hevey, 2018). As noted by Borsboom *et al.* (2021), "network interpretation depends on a judicious choice of which variables to include in the network, and more research is needed to develop theoretical frameworks to guide these choices" (p. 14). Although psychological network analysis continues to experience rapid conceptual and methodological advancements, a current limitation is that estimating models that account for the multilevel nature of data (particularly when implementing regularization techniques, as in the present study) remains computationally challenging (see, e.g., Abacioglu *et al.*, 2019). Additionally, measurement error is not assumed in most network models (Epskamp & Fried, 2018), and that also remains a limitation of the current study. One strategy that can address this issue with larger samples is to use latent network modeling, a more recent technique that estimates network models while specifying latent constructs and controlling for measurement error (see Epskamp *et al.*, 2017). Lastly, as is the case with this study, most research conducted so far using network modeling has been grounded on data-driven exploratory analysis, from which new mechanisms and hypotheses can be identified. Moving forward, it would be important to also advance toward confirmatory network-modeling approaches that allow for formal hypothesis testing (see proposals by Borsboom *et al.*, 2021; Hevey, 2018).

Although not without challenges, network modeling provides a novel quantitative technique for investigating the psychology of language learning and, echoing Freeborn *et al.* (2022), to broaden our understanding of primary constructs from a complex systems perspective. For instance, the fact that models can be estimated at both the group and individual levels can make it possible to integrate, within a single design, both nomothetic and idiographic approaches to the study of systems change (see, e.g., Hiver *et al.*, 2022). Models from intensive time-series data could also be valuable for understanding how network connectivity strength relates to changes in the temporal dynamics of the system. In this respect, network modeling can provide new avenues for testing core principles related to complex dynamic systems theory (e.g., the notion that intraindividual variation is strongly connected to development; Larsen-Freeman & Cameron, 2008; Hiver *et al.*, 2022). However, more theoretical, methodological, and empirical scrutiny will be required before drawing conclusions on how the structure and dynamics of psychological networks may be connected with the tenets and principles of complex systems (see Borsboom *et al.*, 2022, for a discussion on the links between network approaches, models, and theories).

Conclusion

This study has provided novel insights for understanding the complex motivational profile of HL learners in postsecondary classroom contexts. The findings offer

pedagogical implications with respect to how instructors may help foster favorable motivational tendencies in the classroom. The results highlight the importance of encouraging the construction of vibrant future HL self representations and promoting positive visions for communicating in the minority language across school, community, and other contexts. Relatedly, instructors should strive to build supportive classroom atmospheres that encourage effort and where HL learners' mastery goal orientations are promoted over performance goal orientations that capitalize on peer comparisons. In this respect, attention should be drawn to expanding HL learners' critical bilingual competence and achieving a sense of success in linguistic attainment that is based on internalized (as opposed to normative) standards that align with individual HL learners' image of the ideal HL self. Findings suggest that fostering a supportive learning environment is also linked to experiencing facets of HL enjoyment with greater intensity, which is positively associated with HL learners' motivated behavior in the classroom. Lastly, promoting critical language awareness continues to be a central curricular objective for HL classrooms. Although critical language awareness might not be directly linked to HL learners' intended effort to learn the HL, it is likely that it indirectly connects to it by bolstering positive perceptions of their immediate classroom environment and vice versa.

This study also offers useful methodological implications for research into the psychology of language learning. Echoing Freeborn et al. (2022), the findings highlight the potential of network analysis for statistically estimating motivational phenomena as complex systems in consonance with current theoretical conceptualizations in the field. Its utility to help us understand system-level relationships may prove valuable for increasing the quantitative researchability of complex psychological phenomena characterized by high dimensionality, mutual interactivity, unpredictability, and nonlinearity in SLA. Network analysis is also well aligned with the field's increasing efforts to adopt advanced statistical analyses that move away from sole reliance on null-hypothesis testing. In all, this modeling technique has the potential to provide valuable insights that can complement those obtained from more established statistical techniques in this line of inquiry.

Supplementary materials. To view supplementary material for this article, please visit <http://doi.org/10.1017/S0272263123000025>.

Conflicts of interest The authors declare none.

Data availability statement The experiment in this article earned an Open Materials badge for transparent practices. The materials are available at <https://osf.io/z9psd/>

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