

Cross-linguistic Free-speech Markers Of Neuropsychiatric Symptoms In Individuals At Risk For Alzheimer's Disease



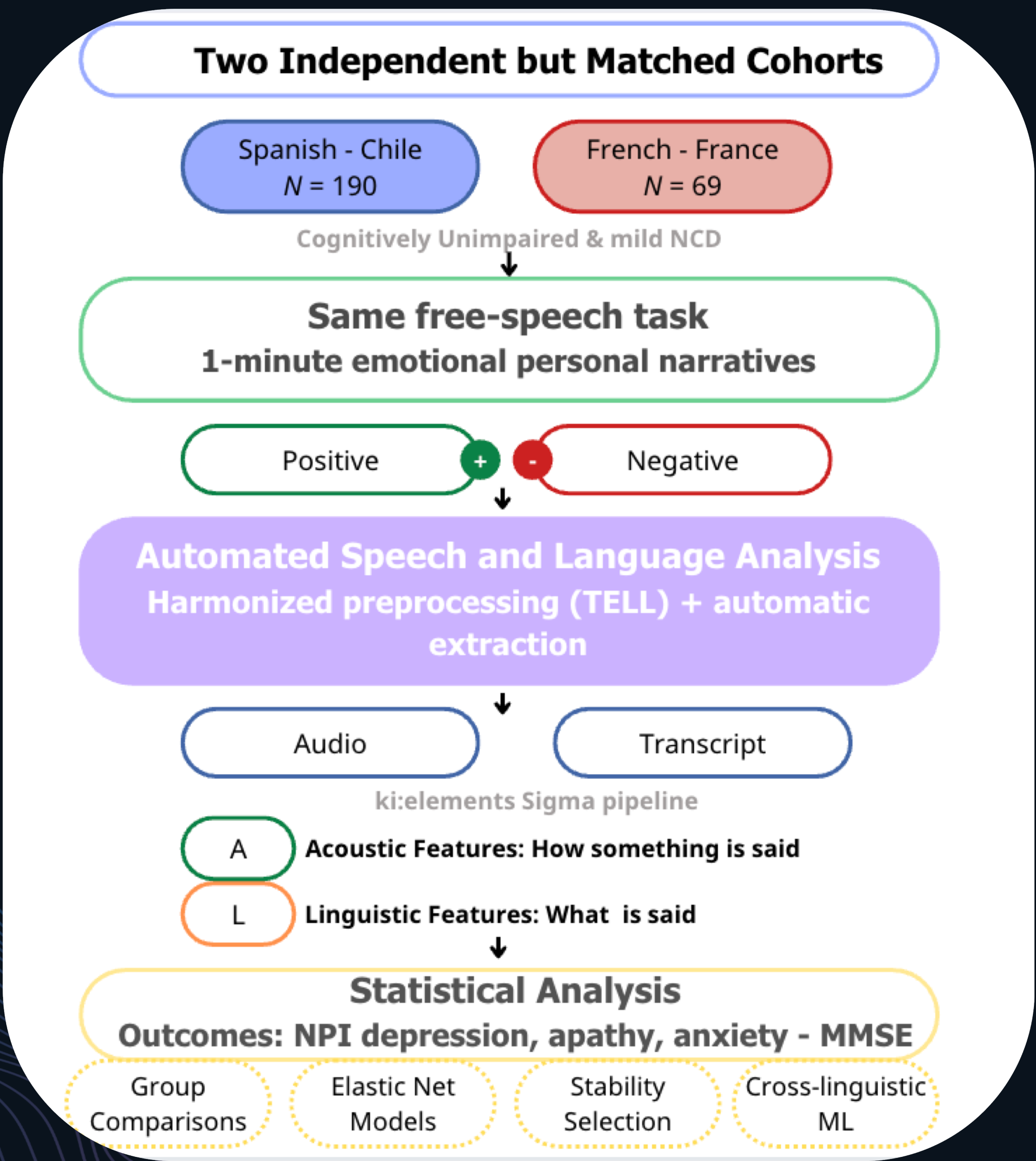
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Introduction

Neuropsychiatric symptoms (NPSs) are risk factors of neurocognitive disorders (NCDs)¹. **Automated speech and language analysis** is a promising approach for capturing NPSs, yet most evidence comes from English speakers, limiting the approach's cross-linguistic relevance². Here, we investigated whether automatically extracted free-speech features predict NPSs severity and global cognition across two Spanish- and French-speaking independent cohorts.

Methods



Results

Among **Spanish** speakers, stable predictors of **depression** spanned sentiment/valence, temporal, energy and linguistic (word-types) domains ($R^2 = 0.13$). Models for apathy and anxiety showed no explanatory value (Fig. 1). **MMSE prediction** ($R^2 = 0.42$) was driven by syntactic complexity/lexical richness, spectral, and temporal features. Similarly to Spanish, in the **French-speaking cohort**, word-type features were stable predictors of **depression** ($R^2 = 0.61$) and **apathy** ($R^2 = 0.50$). For apathy, additional predictors related to energy/spectral and temporal domains. **MMSE prediction** ($R^2 = 0.38$) was driven by lexical richness, spectral and frequency measures (Table 1). Cross-language generalization remained limited across outcomes.

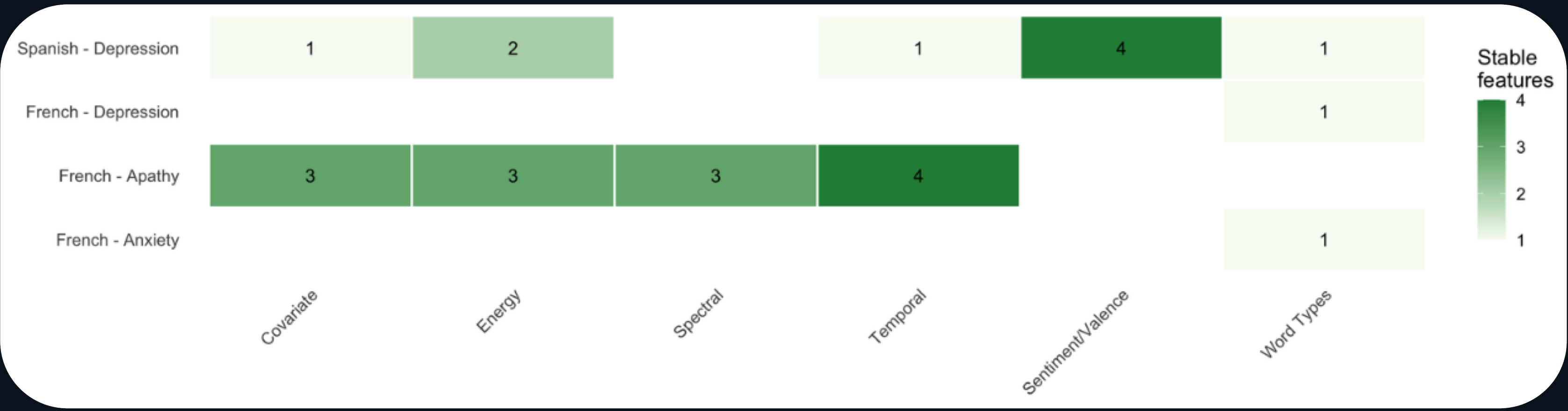


Figure 1. Summary of Elastic Net Models' stable feature selection per NPS outcome

Table 1. Summary of Elastic Net Models' stable feature domains for NPSs and global cognition

Feature Domain	NPS	Cognition	Example
Energy	Prominent	Limited	Loudness, shimmer
Temporal	Prominent	Limited	Pauses
Spectral	Prominent	Prominent	Harmonics, MFCCs
Sentiment	Prominent	Limited	Positive/Negative words
Word Types	Prominent	Prominent	Verb rate, noun rate
Lexical/Syntactic Complexity	Absent	Prominent	Brunet's Index

Conclusion

Shared feature-domains may relate to NPSs (e.g. word-types, temporal) and cognitive status (e.g. lexical richness, spectral) in Spanish and French speakers with NCDs. However, cross-language generalization remains limited, underscoring the need for **larger multilingual datasets and harmonization strategies**.

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