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Susanne M. Reiterer
Editor

Exploring Language Aptitude: Views from Psychology, the Language Sciences, and Cognitive Neuroscience

Springer

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Dedication – to my dear mother who passed away so early

Preface

Language and linguistic behaviour came into the world by biological evolution and by its speakers who shaped all the variation in language which we can scientifically observe right now. Language changes over time, space, between and within individuals. This creates an ever fluctuating "stress field" between universality and individuality. Some of these manifold extralinguistic factors, which contribute to individual variation in linguistic behaviour, concerning first – but also and specifically here – second language learning, are the focus of this book which is based on a collaborative research project on "individual variation in foreign language aptitude", originating from a seminar on second language learning aptitude, the editor had given at the University of Vienna. The project was mainly based at the University of Vienna, in cooperation with the Universities of Graz and Heidelberg.

Human communication originates from social-emotional interaction, face-to-face, in its most basic form. It comprises so many different aspects of our lives: emotional, intellectual-cognitive, physical-motion/motoric, biochemical (neurotransmitters, hormones), social-interactional, sociocultural, psychological, expressive and the like. This patchwork of aspects reflects universal biological, cultural-societal as well as individual needs and personal identities. All these diverse dimensions, which create our communicative behaviour (and ultimately our language or languages as a system), show a lot of individual variation, or individual differences (IDs) – a term more often used in psycholinguistics and psychology – giving rise to individual language learner and speaker profiles. This variation is seen when speaking and acquiring mother tongues, dialects and foreign languages alike. In their first languages, people are so different in their communicative behaviour that it can reach from mutism to logorrhoea, from poor expressive abilities to outstanding rhetoric gifts in orators, from dyslexia and agrammatism to eloquent genius in literary production, from unclear speech in articulation difficulties (e.g. developmental apraxia of speech) to hyper articulation capacities in comedians, parodists and impersonators or singers, as well as from autism to high pragmatic ability in communication talent. Speaker-based individual differences in speech, language and communication behaviour are simply enormous and all too often forgot in scientific models which try to capture the reality of speech and language behaviour

mostly through written language sources, are simplified, assume averaged or ideal speakers' behaviour and often use a binary logic of truth (absence or presence of something, true or false). One example is the often quoted question related to variation in pronunciation performance of early versus later foreign language learners (sensitive period theory), e.g. "can a speaker with a late onset of L2 learning ever achieve native like proficiency in pronunciation?" The answer given or expected is either "yes or no". This also accounts for the often posed question "is it nature or nurture?" The answer could or should rather start with "well, it depends on the distribution of the phenomenon". In our case, language aptitude has long been known and observed to be normally distributed in populations (Gaussian distribution, Neufeld, 1979). A solution to under-realistic or dichotomous models or theories is to "model" language aptitude by using the normal distribution and predict theoretical outcomes in terms of percentages. According to this "model", around 5–15% of individuals (very roughly speaking, every 10th person) can attain phonetic native speaker pronunciation, based on their aptitude profiles. 70% of individuals arrive "only" at an average pronunciation proficiency in a later learned second language, because that can be predicted by their position in the distributional curve; however, those 70% (and not 100) are the ones for whom most models and theories have been developed. Those are the so-called "masses" or the "norm". For yet another 5–15%, it might be enormously difficult to learn foreign languages or the pronunciation of it, if we stick to the above example, and yet for another 2% (or, every 50th person), the ability barriers might make it even almost impossible or just very difficult. However, if we leave out 30% of the whole population, we can no longer talk about "inclusion", speaking in terms of education. Exception and rule should both be included and accommodated in the models and theories to arrive at a description of 100% of all individuals, namely, the whole continuum. In the present volume and in own previous research about the impact of different psychological and neurocognitive factors on language aptitude, we could repeatedly and clearly demonstrate that all aspects of language aptitude we investigated so far (e.g. aptitude for pronunciation, vocabulary learning and associative memory, syntactic sensitivity, even pragmatic or singing ability) are always normally distributed (Christiner & Reiterer, 2013, 2015; Dogil & Reiterer, 2009; Hu et al., 2013; Marusakova 2014; Reiterer et al., 2011; Reiterer, Hu, Sumathi, & Singh, 2013; Wucherer & Reiterer, 2016). Other than this, in our own research, we did not only find neurological or neurocognitive predictors of language aptitude (i.e. individual differences in pronunciation/speech imitation capacities as reflected by brain structure or different activation patterns, as in Reiterer et al., 2011; Hu et al., 2013; Vaquero, Rodriguez-Fornells, & Reiterer, 2017; Turker et al., this volume) but also acoustic-articulatory predictors reflected in characteristic "articulation space" patterns, which were larger for the high- versus low-aptitude individuals, as analysed by modulation spectrum analysis (e.g. Reiterer et al., 2013); phonetic predictors in vowel duration as in the "schwa" sound, which we observed to be as short in native L1 speakers as in very talented second language speakers' pronunciation samples (see Ghafoorian, this volume); and cross-domain cognitive predictors relevant for speech imitation aptitude, like general musicality, singing abilities and working memory (Christiner & Reiterer,

2013, 2015, 2016; Nardo & Reiterer, 2009); characteristic personality aspects (Rota & Reiterer, 2009; Hu et al., 2013), amongst which "openness for new experience" seems to relate to L2 aptitude; as well as gender differences differentially reflecting language aptitude for speech imitation versus grammar and vocabulary learning (Wucherer & Reiterer, 2016; Habl, this volume).

The normal distribution of a phenomenon (be it aptitude, body weight, body size, etc.) also points at a potentially underlying biological system. However, there is still paucity of research into the biological, biochemical or genetic roots of language aptitude (probably due to financial and methodological complexities and constraints), apart from a very laudable recent upstream and increased interest into the genetic foundations and hereditability of second language learning/acquisition (as opposed to first language acquisition) and language abilities in general and the individual differences thereof (e.g. see Dale, Harlaar, Haworth, & Plomin, 2010; Hayiou, Dale, & Plomin, 2012; Dediu, 2008; Dediu & Ladd, 2007). Still in its beginnings and complex to investigate, it seems that second language acquisition (and hence what we can observe as adult second language learning aptitude) is subserved to a higher degree by heredity and hereditable factors than first language acquisition (Dale et al., 2010). This interesting result could be due to the fact that massive exposure time and experience with native languages overrides genetic influences and "levels them out", influences and differences which would potentially have been there in the first place as well. Not only genetic influences on second language acquisition or aptitude have recently been accumulated, but a steadily increasing body of research seems to emerge investigating the neural substrates of individual differences in expertise and success of foreign and second language learning, mostly in adult language learners. Brain function mostly via fMRI (functional magnetic resonance imaging) (Golestani & Zatorre, 2004; Hu et al., 2013; Kepinska et al., 2016; Reiterer et al., 2011) or EEG (electroencephalography) (Dogil & Reiterer, 2009), brain network states – so-called connectivity patterns or even "resting-state" patterns (fMRI, EEG) (Chai et al., 2016; Kepinska et al., 2017a, b; Prat, Yamasaki, Kluender, & Stocco, 2016) – as well as brain anatomy and brain structure (via MRI or DTI, diffusion tensor imaging) (Golestani & Pallier, 2007; Reiterer et al., 2011; Vaquero, Rodriguez-Fornells, & Reiterer, 2017; Turker et al., this volume) differences linked to individual differences are more and more investigated, and potential brain markers or "predictors" of language aptitude or language learning abilities in general are discerned and described. This recent cognitive neuroscience upstream in individual differences research concerning language abilities as one of the important cognitive abilities is mirrored in an increased interest within the field of SLA proper as well (Biedron, 2015; Darcy, Mora, & Daidone, 2016; Granena & Long, 2013; Safronova & Mora, 2012; Wen, Biedron, & Skehan, 2017).

In our own research focussing more on phonetic and speech imitation aptitude, apart from brain markers, we found markers in other psycho-cognitive domains. Higher speech imitation aptitude in adults and children was accompanied first and foremost by higher singing abilities but also higher general musicality and auditory working memory (Christiner, this volume; Christiner & Reiterer, 2015, 2013; Nardo and Reiterer, 2009), increased openness to new experience and empathy as person-

ality markers (Hu et al., 2013; Rota & Reiterer, 2009) and differed between the sexes – with males showing elevated speech imitation skills and females showing superiority in grammar and vocabulary learning aptitude (Wucherer & Reiterer, 2016). As a phonetic marker of pronunciation aptitude for English as a second language, we could repeatedly isolate the initial schwa sound, mostly in content words, as a good predictor of overall pronunciation ability in L2 (Ghafoorian, this volume); we found minor markers in knowledge of multiple L1 dialects and increased speech imitation ability in L2; finally, we found very low to no correlations between L2 phonetic imitation aptitude and general nonverbal IQ, reading speed and executive functions. Last but not least, we always found all language aptitude subcomponents (e.g. phonetic, grammatical, lexical, pragmatic) to be normally distributed.

However, because the phenomenon of language aptitude is highly complex, influenced by many domains and factors (social, genetic, neuroscientific, psychological, cognitive and the like), we strived to explore it further by means of the manifold research projects comprised in this volume, by looking at many different factors to hopefully shed more light onto this complex phenomenon, which was a forgotten research field during the last decades before 2000, but now no longer is.

Thus, we are enthusiastic and hopeful that the field of aptitude research for foreign and second language learning will develop tremendously in the future years again.

Vienna, Wien, Austria — Susanne Maria Reiterer

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