

Cognitive States in Third Language Acquisition and Beyond: Theoretical and Methodological Paths Forward

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In their keynote, *The Full Transfer/Full Access model and L3 cognitive states*, Schwartz and Sprouse (2020), henceforth S&S, take the reader through the epistemological argumentation underlying the construct of full transfer (FT)—the copying of a completely specified previously acquired grammar at the abstract level as the initial interlanguage grammar in subsequent acquisition. Although S&S are clear about how they envisage full transfer within a generative framework, transfer is, of course, not a generative linguistic notion per se. Thus S&S's conceptualization of full transfer can, in principle, be reinterpreted regardless of what one's assumptions are about how mental representations of grammars come to be in the mind (provided one assumes there are mental grammatical representations). They present and critique the models and empirical data of third language (L3) acquisition that underlie debates regarding FT's applicability to additive multilingual acquisition in adulthood, if not FT's efficacy and/or reality overall. It is fitting that S&S should write such a piece, not least since their three-decade-strong model *Full Transfer/Full Access* (FT/FA) for adult second language (L2) (Schwartz & Sprouse 1994, 1996) sits at the core of L3 models purporting full transfer and those questioning the very notion alike. As they convincingly discuss, the underlying logic of FT/FA should equally apply to L3 acquisition, notwithstanding important differences that might obtain between L2 & L3 contexts. Beyond offering interesting reinterpretations of existing data sets in the literature, S&S offer novel methodological insights (e.g. varying L1s in the triplet language pairing while maintaining constant the L2s and L3s as well as proficiency therein) which could provide unique and complementary windows into L3 learning while rendering the sourcing of participants easier. Furthermore, S&S provide suggestions for how formal approaches to L3 acquisition should expand its remit in the near future, such as underscoring the need for examining L3 development proper and testing for the contributions of universal grammar (UG) therein. While we do not see any reason why UG would be differentially accessible in L3 as compared to adult L2 acquisition where, to our minds, very strong evidence exists indicating UG's continued involvement irrespective of age, examining poverty of the stimulus in L3 acquisition would be welcome and offer opportunities for shedding novel light on longstanding questions/debates in non-native acquisition research (see Iverson 2009, 2010). Since we essentially agree with all that S&S covered and argued, we limit the remainder of our commentary to two things: (a) unpacking an important epistemological point S&S mention only in passing and (b) suggesting and framing why incorporating online processing, specifically neuroimaging methods could be especially fruitful moving forward.

On cognitive adaptation in additive multilingualism: Are L3 and Ln the same?

S&S mention that they use the term L3 in the article as a catchall proxy for additional language acquisition beyond L2. They do so because L3/Ln is standardly used in the literature, potentially giving the impression that Ln beyond L2 is essentially the same for the relevant domains at hand (e.g. transfer sourcing and completeness). However, do we know that L3 and Ln are the same in this regard? The short answer is: *no*. This is an empirical question, which, to our knowledge has never been the focus of specific research, at least in the controlled manner required. Properly testing this is worth doing, not least because the implications of ruling out differences or revealing them are non-trivial. Imagine that a controlled investigation were to show that L3 and L4 are, in fact, distinct as it pertains to the completeness of transfer (e.g. full transfer in L3, but seemingly property-by-property in L4). Given the fact that many so-called L3 studies collapse multilingual participants who are in fact acquiring their fourth, fifth or more language, this practice alone could be adding noise to the signal. If so, the semblance of property-by-property transfer and/or transfer from multiple source grammars in so-called L3 could be a byproduct of the heterogeneity of the participant pool in the relevant sense. This reality is something that has always preoccupied us. For this reason, work coming from our lab for as long as we have been working on L3 includes only true L3 learners (those with only one previously acquired language in adulthood).

Although the data do not exist to point in either direction definitively, we believe there is good theoretical reason to not *a priori* dismiss the potential for L3 and Ln+ being distinct as it relates to transfer at the initial interlanguage grammar state. Space does not permit us to go through the entirety of the logic underlying this possibility, however, as we have discussed this in several places in greater detail we direct the reader to those sources for a more complete discussions of this in Rothman, 2015; González Alonso and Rothman, 2017; Rothman et al., 2019; González Alonso and Rothman, 2020. In brief, to the extent that there is full transfer in true L3, depending on the language pairings implicated, there is sure to have been significant needs for restructuring from the transfer source. In other words, as in L2 development, full transfer in L3 will mean that parsing failures will arise when the L3 input cannot be accommodated throughout development. L3 learning constitutes, then, reconfiguration of initially specified (via transfer) grammatical representations. The experience of having had to reconfigure could result in relevant cognitive adaptations, the result of which is more conservative transfer the next time around resulting in a property-by-property approach. If so, why would this not be the case in L3 acquisition since parsing failure-induced reconfiguration, under a FT approach, is also part and parcel of the process via L1 transfer? We submit that in L2 acquisition the specific experience needed to promote the relevant adaptation in cognitive processing is lacking. Why? Because in L2 acquisition, unlike L3, there is no selection process among competing grammars. Transfer happens from one source, the L1, or not at all in L2 acquisition. Given the default nature of transfer in L2, the mind has not experienced what happens when transfer sourcing can be selective (and potentially motivated by language specific factors as argued under the TPM). In L3, however, parsing failures over the course of development when there were choices could be sufficient experience for the mind to proverbially “learn” holistic transfer is not without developmental consequences. The role of

experience in shaping cognitive processing, i.e. not the underlying mechanisms themselves, is well attested outside of language acquisition. For example, human visual processing—higher-order processing by vision centers of the brain of the low-level information acquired by the system’s sensors (the retina)—is affected with significant video game playing (e.g. Castel et al., 2005; Green & Bavelier, 2007). By analogy, it is not so far-fetched that L3 acquisition experience could impact how transfer obtains in further acquisition, the possibility of which can and should be empirically tested.

Untapped methods: A Psycholinguistic Turn

In line with S&S’s suggestions for future directions in L3 research, we highlight additional methodological considerations. We would like to make the case that adopting more psycholinguistic methods in L3 acquisition, which has been increasingly (and successfully) done in generative approaches to L2 acquisition over at least the last decade or so (see Roberts et al., 2018; Rothman & Slabakova, 2018), would subserve the expansion of the questions in L3 related to development as suggested by S&S while offering improved granularity for the object of study. Critically, we submit that online processing methodologies such as eye-tracking and electroencephalography (EEG) could offer novel, complementary evidence to adjudicate between existing theoretical positions tested (almost exclusively) to date with off-line behavioral methods.

As a case in point, let us consider the use of event related potentials (ERPs) in the context of the L3 transfer theories reviewed by S&S. As discussed in Rothman, Alemán Bañón and González Alonso (2015), the (then) available L3 transfer models such as the Cumulative Enhancement Model (Flynn et al., 2004), the L2 Status Factor (Bardel & Falk, 2007) and the TPM could, depending on the language pairing and carefully selected domain of grammar, make distinct predictions for which ERP signatures would be expected after initial exposure to an L3. Previous work in L2 has shown that ERPs are capable of capturing transfer effects in early stages of interlanguage development (e.g. Gabriele, Fiorentino & Alemán-Bañón, 2013; Alemán-Bañón, Fiorentino & Gabriele, 2018), making it in principle reasonable to expect that transfer could be captured with this method. In the first study of its kind, González Alonso et al. (2020) examined both behavioural and brain correlates of linguistic transfer at the (very) initial stages of L3 acquisition. They created two artificial (mini)-grammars (AGs) lexically based on English and Spanish, yet both had a nominal agreement system (similar to Spanish) with unique morphology phonotactically possible in both base grammars: gender (between articles and adjectives) and number (among subject-verb, articles, and adjectives) agreement. The study was divided in two phases. In the learning phase, Spanish native speakers of L2 English learned either the mini-English AG or mini-Spanish AG. In the testing phase, participants were first tested via a sentence-picture matching task and, upon showing an 80% accuracy in this task, they moved on to the ERP experiment where ungrammatical agreement sentences were introduced for the first time. Interestingly, the results did not conform with the predicted scenarios for ERP components (P600 or N400) outlined in Rothman, Alemán Bañón and González Alonso (2015). However, what was observed was in some ways more interesting. Despite the groups being matched in all relevant

ways except for which AG they were exposed to, their performances differed. This was reflected in an early positivity (P300) component that was visible only in the Mini-Spanish exposed group. The P300 is an ERP component commonly related to focused attention (Polich, 2012). The authors interpreted its presence as evidence of a precursor for transfer at a later stage. Recall this was absolute initial exposure and so the P300 was interpreted to reflect the process of transfer selection itself. Under such an interpretation, only models that allow for structural effects conditioning selection would be supported, i.e the TPM or the Linguistic Proximity Model (Westergaard et al., 2017), as only they predict an asymmetry between the Mini-Spanish and Mini-English groups. This opens up new questions and ideas for studies. For example, longer training sessions with intervals between them for consolidation might determine the amount of exposure needed for one to have a better chance at capturing the state of the true initial L3 interlanguage grammar. This would allow better adjudication between competing models of transfer source selection.

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