

Language, Plasticity and Learning – developmental issues

In the context of their on-going work on language acquisition, the members of the ADYLOC GDR research network have invited a group of experts to a two-day workshop taking place in Paris on November 5-6 2015. The workshop will address the links between language acquisition, cerebral plasticity, behavioral flexibility and human learning. The goal of the workshop is to enable language acquisition researchers to gain new perspectives on their data and on their theoretical orientations, from recent findings in these areas.

Dans le cadre de leur groupe de travail sur l'acquisition du langage, les membres du réseau Groupe de Recherche ADYLOC se proposent d'inviter un groupe d'experts pour un workshop qui aura lieu à Paris les 5 et 6 novembre 2015 et dont les thèmes portent sur les liens entre acquisition du langage, plasticité cérébrale, flexibilité comportementale et processus d'apprentissages humains. A l'occasion de cet atelier les chercheurs en acquisition du langage souhaitent mettre en perspective leurs données et leurs interrogations théoriques à la lumière des dernières avancées de ces domaines.



Thursday, 5 November:

10h00-10h15 Opening - about Adyloc

10h15-11h00 Michèle Kail – Adaptive functions of neuro-behavioral plasticity in L1 and L2 language acquisition. *DR CNRS, UMR 7023 Structures formelles du langage*

11h00-11h15 Pause

11h15-12h00 Patrick Lemaire – Studying Strategic Variations During Cognitive Aging : Does it further our understanding of cognitive plasticity throughout lifespan? *CNRS Laboratoire de Psychologie cognitive, Université Aix-Marseille*

12h00-12h45 Alex Cristia – Stats for babies: How far can they go? *CNRS – UMR 8554 Laboratoire de Sciences Cognitives et Psycholinguistique*

12h45-14h15 Lunch

14h15-15h00 Natascha Müller – Delay and acceleration in bilingual first language acquisition: Different sources. *Bergische Universität Wuppertal*

15h00-15h45 Jonas Granfeldt – On the Respective Roles of Age of Onset of Acquisition and Input for Developing Morphosyntax: The Case of French. *Lund University*

15h45-16h00 Pause

16h00-16h45 Frédéric Isel – Neuroplasticity of second language acquisition: The critical role of targeted and individualized learning. *Sorbonne Paris Cité-Paris Descartes University Institute of Psychology*

16h45-17h30 General discussion for the day

Friday, 6 November:

9h30-10h15 Barbara Köpke – Cerebral plasticity in language development and use: What does language attrition tell us? *Unité de Recherche Interdisciplinaire Octogone-Lordat (EA 4156), Université de Toulouse 2*

10h15-11h00 David Birdsong – Where Things Stand in Critical Period Research. *University of Texas at Austin*

11h00-11h15 Pause

11h15-12h00 Christian Xerri – Neuroplasticity: a link between educational neuroscience, remediation and the brain. *Aix-Marseille University/CNRS Integrative and Adaptive Neuroscience Laboratory, Marseille*

12h00-12h45 Final round table: future perspectives



David Birdsong – Where Things Stand in Critical Period Research

University of Texas at Austin

With the goal of providing a state-of-the-art analytical review of critical period (CP) research in language development, I examine several recent studies (published and unpublished) that argue for, or against, CP constraints on L1 and L2 acquisition. Specific considerations include: bio-chemical and environmental regulation of CP phases and timing in language acquisition; the cognitive neuroscience of aging; geometric features of CPs; bilingual first language development; CPs for language acquisition compared to CPs other domains (e.g. addiction, autism); animal models of CPs; and nativelike attainment in L2 acquisition. Looking back on earlier research, I identify pitfalls in key studies. Looking forward, I suggest ways to reconcile known biological influences in L2 acquisition with other well-studied factors and with the nature of bilingualism. Examples from the acquisition of French and English are featured.



Alex Cristia – Stats for babies: How far can they go?

CNRS – UMR 8554 Laboratoire de Sciences Cognitives et Psycholinguistique

In literally hundreds of experiments, infants and young children have been presented with stimuli in which an experimenter had (more or less ostensively) built a statistical regularity, and the key question is whether the child can 'pick up' on that regularity. In this way, we have tried to figure out how infants learn sounds, word forms, word-to-meaning mapping, morphology, and syntax, within language, and broader regularities beyond language.

My talk will provide a broad overview of these results, highlighting areas of conceptual and empirical agreement and disagreement. In terms of conceptual agreement, we observe clear trends for:

- incorporating innate biases explicitly, for instance through Bayesian formulations that take into account both priors and experience
- attributing many, but not all, innate biases to cognitive-general principles (rather than language-specific ones)
- considering multiple linguistic levels and cues (rather than focusing on a single one).

As for empirical (dis)agreement, results for learning of sound categories are probably the weakest (small effect sizes, unreliable cross-lab replications), word forms intermediate, word-to-meaning strong, with a great deal less work (comparatively) on morphology and syntax.

I will additionally discuss two salient problems that arise when considering statistical learning in the context of early language acquisition. The first relates to the definition of "statistical learning" - which I will argue is actually an umbrella term that may be best abandoned. The second relates to the value of laboratory experiments with hyper-controlled stimuli as a potential explanation for real life development. I will discuss to what extent computational modeling and the study of individual variation can help us bridge the gap between the lab and the real world.



Jonas Granfeldt – On the Respective Roles of Age of Onset of Acquisition and Input for Developing Morphosyntax: The Case of French

Lund University

There's a long-standing debate regarding the main factors underlying linguistic development in (bilingual) children and adult second language learners. Two independent variables, *Age of Onset of Acquisition* and *input conditions*, have been particularly emphasized in the literature and often contrasted (Unsworth, 2013). On the one hand, proponents of maturational accounts (e.g. Meisel, 2008), adopting a version of the *Critical Period Hypothesis* (Lenneberg, 1967), have argued on the basis of both linguistic and neuropsychological evidence that the Language Making Capacity undergoes a substantive change during a period of maturation which, in turn, leads to qualitative differences between child (L1) and adult (L2) language acquisition. On the other hand, proponents of usage-based accounts (e.g. Bybee, 2008) have argued that grammar is built up through experience with specific examples of construction which, in turn, points to the crucial role of quality and quantity of input

for linguistic development in all modes of acquisition.

Interestingly, recent research suggest that different aspects of language are more or less influenced by AOA and input conditions respectively (Unsworth, *et al*, 2011, Ågren, Granfeldt & Thomas, 2014a, Granfeldt, 2015). Whereas there is an agreement that *lexical development* is particularly influenced by input conditions (Thordardottir, 2011, Ågren, Granfeldt & Thomas, 2014b), the question is currently open with respect to *grammatical development*. One view is that quantity and quality of input is particularly important in the acquisition of “late”, “harder” or “more opaque” grammatical structures (Gathercole, 2007; Unsworth *et al.*, 2014). These are structures typically involving an interface relationship of some kind (Sorace, 2005, Tsimpli, 2014).

In this presentation I propose to review some of the relevant literature in the field and present a summary of findings from a project at Lund University (Sweden) focusing on the longitudinal development of French in simultaneous and successive Swedish-French bilinguals growing up in Sweden. The successive bilinguals, referred to as the child L2 learners, had an AOA of either 3,5 years or 6,5 years. The project also included age-matched French monolingual controls growing up in Sweden.

In this project AOA, input conditions and possible cross-linguistic influence were largely controlled for allowing for a serious discussion of the effect of each of the two main independent variables (AOA and input conditions) on the development of vocabulary and different grammatical structures in French. Comparisons were also made throughout with results from previous results on L1 monolingual acquisition and adult second language acquisition of French (L1 Swedish) in order to reveal differences and similarities in linguistic development across different modes of acquisition.

Overall the findings of the project show that both factors, AOA and input conditions, play a role for the route and the rate of linguistic development (Granfeldt, Schlyter & Kihlstedt, 2007, Granfeldt, 2012, Ågren, Granfeldt & Thomas, 2014a, Granfeldt, 2015). However, AOA and Input seem to affect the development of different morphosyntactic structures. Some features, e.g. finiteness, object clitics and gender concord, seem to be more sensitive to AOA whereas others, e.g. S-V agreement and gender attribution, seem to correlate with input conditions as operationalized within the project.

I will end my presentation by sketching an account for these findings in which different factors interact during different moments of L1 and L2 development and where AOA-effects are interpreted as a result of the successive growth of the L1.

Ågren, M., Granfeldt, J. & Thomas, A. (2014a). Combined effects of age of onset and input on the development of different grammatical structures: A study of simultaneous and successive acquisition of French. *Linguistic Approaches to Bilingualism*, 4, 461-492. John Benjamins.

Ågren, M., Granfeldt, J. & Thomas, A. (2014b). The effect of quantity and quality of input on vocabulary and grammar development in French. Presentation at IASCL, Amsterdam, July 2014.

Bybee, Joan. 2008. Usage-based grammar and second language acquisition. In *Handbook of cognitive linguistics and second language acquisition*, edited by P. Robinson and N. C. Ellis. London: Routledge.

Granfeldt, J. (2015). The development of gender in simultaneous and successive bilingual acquisition of French : Evidence for AOA and input effects. Presentation at EuroSLA 25, Aix-en-Provence, August 24 - 26 2015.

Granfeldt, J. (2012). Development of Object Clitics in Child L2 French A comparison of developmental sequences in different modes of acquisition. *Language, Interaction and Acquisition*, 3, 140-162. John Benjamins Publishing Company.

Gathercole, V.C.M. (2007). Miami and North Wales, so far and yet so near: A constructivist account of morpho-syntactic development in bilingual children. *International Journal of Bilingual Education and Bilingualism*, 10, 224–247.

Lenneberg, E. (1967). *Biological foundations of language*. New York: Wiley and Sons.

Meisel, J. M. (2008). Child second language acquisition or successive first language acquisition? In B. Haznedar & E. Gavrusseva (eds.), *Current trends in child second language acquisition: A generative perspective*, pp. 55–80. Amsterdam: John Benjamins.

Sorace, A. (2005). Syntactic optionality at interfaces. In L. Cornips, & K. Corrigan (eds.) *Syntax and Variation: Reconciling the biological and the social* (pp. 46–111). Amsterdam: John Benjamins.

Thordardottir, E. (2011). The relationship between bilingual exposure and vocabulary development. *International Journal of Bilingualism*, 1-20.

Tsimpli, I.M. (2014). Early, late or very late? Timing acquisition and bilingualism. *Linguistic Approaches to Bilingualism* 4:3, 283–313. DOI: 10.1075/lab.4.3.01tsi.

Unsworth, S. (2013). Assessing the role of current and cumulative exposure in simultaneous bilingual acquisition: The case of Dutch gender. *Bilingualism: Language and Cognition*, 16, 86-110, doi:10.1017/S1366728912000284.

Unsworth, S., Argyri, F., Cornips, L., Hulk, A., Sorace, A., & Tsimpli, I.M. (2014). On the role of age of onset and input in early child bilingualism in Greek and Dutch. *Applied Psycholinguistics*, 35, 765–805, doi.org/10.1017/S0142716412000574.



Frédéric Isel – Neuroplasticity of second language acquisition: The critical role of targeted and individualized learning

Sorbonne Paris Cité – Paris Descartes University Institute of Psychology

The notion of critical period, borrowed from embryology, was used by some linguists in order to link brain maturation and development of language skills.

According to this theoretical approach, the acquisition of certain language skills as segmental phonology, inflectional morphology, and syntax could be directly constrained by the maturation of certain brain areas dedicated to language processing. Therefore, this theoretical point of view postulates that learning a second language may preferentially occur for a short period of time in human development, and beyond this period second language learners could not afford to achieve the same level of competence as a native speaker.

A longstanding debate in linguistics and in psycholinguistics attempts to evaluate the validity of this concept for language acquisition. Critically, empirical evidence collected by psycholinguists seriously question the existence of a short period with a specific onset and offset during which certain aspects of language acquisition could take place.

Indeed, combined behavioral, neurophysiological and neuroimaging data suggest that certain linguistic and contextual factors might be better predictors of second language acquisition. Furthermore, recent studies bridging psycholinguistic and didactic methods

show that the effectiveness of learning is reinforced when learning programs are designed by taking into consideration the grammatical specificities of the first and of the second languages.

In my talk, I will present selected data on phonological and syntactic processing in second language learners, which lend support to the view that learning of phonological and syntactic rules of a second language can be successfully regardless of the age of acquisition of this language. In particular, I will introduce the notion of targeted and individualized learning based on the grammatical properties of the first and the second language.



Michèle Kail – Adaptive functions of neuro-behavioral plasticity in L1 and L2 language acquisition

DR CNRS, UMR 7023 Structures formelles du langage

Contrary to assumptions that changes in brain networks are possible only during crucial periods of development (CPH), research in the past decade has supported the idea of a permanently plastic brain (with various degrees of plasticity). In L1 and L2 language acquisition and processing, further exploration is needed to know how linguistic capacities emerge from and are constrained by core structural and functional networks of the brain and how experience shapes that neural circuitry.

Keeping in mind that change is the main adaptive property of the brain, one crucial issue is how early learning leads to dedicate cognitive and neural structures that impact the process and outcome of later development. This review presents recent progress in our understanding of the neuro-behavioral dynamics of change in some relevant domains for plasticity.

- The Early speech learning system in monolingual infants: Recent data show that the learning processes in phoneme learning (organization and reorganization) are complex and multi-modal (cf. the native neural commitment hypothesis). Moreover, data attest that these early capacities require a social context.
- Lexical organization in bilingual children: Results of experiments, computational modeling (DevLex Model) and neuro-imaging studies indicate that the dual action of competition and entrenchment brings new insights into the interactive dynamics of bilingualism. Moreover, structural brain changes (increased gray matter and white matter integrity) in relation with better executive control leads to the assumption that bilingual experience is somewhat unique with its own neural signatures.



Barbara Köpke – Cerebral plasticity in language development and use: What does language attrition tell us?

Unité de Recherche Interdisciplinaire Octogone-Lordat (EA 4156), Université de Toulouse 2

Research in neurosciences has shown that intensive training in a complex motor or cognitive skill such as juggling (Draganski et al 2006) or learning a new language (Osterhout et al 2006, 2008; Mecelli et al. 2004) leads to rapid changes in grey matter density and the brain's electrical activity. The latter studies suggest that the brain structure of the adult second language learner is extremely dynamic, even in, or specifically in the first stages of learning a new language. Research on language attrition has shown that

this dynamic is not only due to the acquisition of new linguistic knowledge or processing skills, but also to the restructuring of already existing knowledge and adaptation of processing skills.

While the beginnings of language attrition research were characterised by a specific interest for the attrition of a second or foreign language (Ginsberg, 1986) and a lack of distinction from sociolinguistic studies on language contact, shift and death (see De Bot, 2001), the growing awareness of the psycho- and neurolinguistic mechanisms involved in attrition explains why research focussed more and more on first language attrition in bilingual individuals. The field of language attrition progressively became a part (or a counterpart) of second language acquisition research (SLA). In many ways, research on language attrition is complementary to SLA and has contributed interesting insights into a number of issues that have been debated in SLA for years, such as the critical period hypothesis (Köpke & Schmid, 2011; Schmid, 2014).

This talk will focus on three issues which are generally supposed to play a major role in language attrition: (a) time, contributing to the growing inaccessibility of linguistic knowledge in frameworks such as the Activation Threshold Hypothesis (ATH, e.g., Köpke, 2002; Paradis, 2007); (b) frequency of use, complementary to time in the ATH, and one of the most popular factors evoked in order to explain the arising of language attrition; (c) age at onset of acquisition/bilingualism/attrition in relation with maturational constraints.

- De Bot, K. (2001). Language use as an interface between sociolinguistic and psycholinguistic processes in language attrition and language shift. In J. Klatter-Folmer & P. van Avermaet (éds.) *Theories on maintenance and loss of minority languages. Towards a more integrated explanatory framework* (pp. 65-82). Münster : Waxmann.
- Draganski, B., Gaser, C., Kempermann, G., Kuhn, H. G., Winkler, J., Buchel, C. & May, A. (2006). Temporal and spatial dynamics of brain structure changes during extensive learning. *Journal of Neuroscience*, 26: 6314–6317.
- Ginsberg, R.B. (1986). Issues in the analysis of language loss: Methodology of the Language Skills Attrition Project. In *Language attrition in progress*, B. Weltens, K. de Bot and T. van Els (eds), 19-36. Dordrecht: Foris.
- Köpke, B. (2002). Activation Thresholds and non-pathological first language attrition. In F. Fabbro (éd.) *Advances in the Neurolinguistics of Bilingualism. Essays in Honor of Michel Paradis* (pp. 119-142). Udine : Forum.
- Köpke, B. & Schmid, M.S. (2011). L'attrition de la première langue en tant que phénomène psycholinguistique. *Language, Interaction & Acquisition (LIA)*, 2 (2), 197-220.
- Mechelli, A., Crinion, J.T., Noppeney, U., O'Doherty, J., Ashburner, J., Frackowiak, R.S., Price, C.J. (2004). Neurolinguistics: structural plasticity in the bilingual brain. *Nature*, 431: 757.
- Osterhout, L., McLaughlin, J., Pitkanen, I., Frenck-Mestre, C., & Molinaro, N. (2006). Novice learners, longitudinal designs, and event-related potentials: A paradigm for exploring the neurocognition of second-language processing. *Language Learning*, 56, 199-230.
- Osterhout, L., Poliakov, A., Inoue, K., McLaughlin, J., Valentine, G., Pitkanen, I., Frenck-Mestre, C. & Hirschensohn, J. (2008). Second language learning and changes in the brain. *Journal of Neurolinguistics*. 21(6): 509–521.
- Schmid, Monika S. (2014). The debate on maturational constraints in bilingual development: a perspective from first language attrition. *Language acquisition* 21(4), 386-410.



Patrick Lemaire – Studying Strategic Variations During Cognitive Aging : Does it further our understanding of cognitive plasticity throughout lifespan?

CNRS Laboratoire de Psychologie cognitive, Université Aix-Marseille

Recent research in cognitive aging led cognitive scientists to revisit traditional views of cognitive plasticity during lifespan. Initial findings in cognitive aging revealed that cognitive performance declines with age in a wide variety of domains, ranging from pattern recognition, attention, categorization, memory, spatial process, problem solving, reasoning, and decision making. More recent findings revealed important variability across domains (e.g., language skills decrease later and much less than other cognitive domains) and across individuals (e.g., some adults age faster and much more than others whose cognitive decline is either quasi-inexistent or very small until very old age). These recent findings suggest much larger cognitive plasticity during old age than could be envisaged from traditional findings. Factors like level of initial formal education, leisure activities, occupation, physical activities, diet, and others greatly modulate age-related changes in human cognition. The mechanisms underlying such modulations and individual differences are now under close scrutiny. Their study benefits from new conceptual and methodological approaches. For example, conceptually, the strategy perspective (Lemaire, 2015) reveals that cognitive plasticity, and age-related changes therein, is the results of highly-functioning older adults being able to compensate age-related changes in human cognition by using most efficient strategies to accomplish cognitive tasks, by selecting most efficient strategies more often overall and more efficiently on specific items, and by using both neural and functional resources to execute strategies on each item more

effectively. In the present talk, I will illustrate in a variety of cognitive domains (outside language) how a strategy perspective deepens our understanding of cognitive aging, and can help us think further about cognitive plasticity and its age-related changes throughout lifespan.

Lemaire, P. (2015). *Viellissement cognitif et adaptations stratégiques*. Bruxelles : De Boeck Université [English Version : Lemaire, P. (Nov 2015), *Cognitive Aging : The Role of Strategies*. London : Psychology Press].



Natascha Müller –Delay and acceleration in bilingual first language acquisition : Different sources

Bergische Universität Wuppertal

Paradis & Genesee (1996) point out that the path simultaneous bilingual children take in language development can differ in two ways from monolinguals: delay, i.e. the speed of acquisition is reduced in bilinguals as compared with monolinguals and acceleration, i.e. the speed of acquisition is accelerated in bilinguals. In the literature on adult second language (L2) acquisition, delay and acceleration observed in the non-native second language are often ascribed to cross-linguistic influence, in particular to transfer of grammatical knowledge of the native language (or some previously learnt L2) to the L2. If the native language and the L2 differ with respect to the grammatical property in question, negative transfer results ; if there is no difference between the native language and the L2, positive transfer speeds up the acquisition process in the L2. As for simultaneous bilingual children, delay has been reported in a number of studies. However, rare are the studies which have observed acceleration effects, even for language pairs which exhibit a lot of linguistic similarities.

It will be argued that the two effects observed in bilingual first language acquisition, delay and acceleration, have different sources. Whereas delay can be due to cross-linguistic influence in the individual or to the mere fact of the burden to process two languages, acceleration is always rooted in efficient computation in a non-linguistic sense (cf. third factor effects in Chomsky's 2005 sense). Empirical support for the difference between delay and acceleration effects comes from the acquisition of different grammatical properties in children who are raised bilingually with German and a Romance language (French, Italian, Spanish) or with two Romance languages from birth in Germany or in the Romance countries. In contrast to delay, acceleration is completely independent of the language combination and language (im)balance. It falls out rather naturally that linguistic development is immune to acceleration, while it can be delayed in bilingual children as compared to monolinguals.



Christian Xerri - Neuroplasticity: a link between educational neuroscience, remediation and the brain

Aix-Marseille University/CNRS Integrative and Adaptive Neuroscience Laboratory, Marseille

During most of the 20th century, neuroscientists maintained a scientific consensus that the brain structure was relatively immutable after critical periods during early childhood. This belief has been challenged over the last three decades by numerous findings revealing that neuronal circuits can be shaped, structurally and functionally, in response to novel experience throughout life. The dynamic nature of brain functions and the capacity for plastic changes in mature neural systems are now widely accepted as pivotal for memory, learning and adaptability of behavior, as well as recovery from brain damage. Nevertheless, as neuroscientists are engaged in a reconciliation of these historically opposite viewpoints, the constraints imposed by developmental experience on the potential for plastic changes in the adult remained to be thoroughly explored.

In addition, the concept of cognitive and cerebral reserves ensuring a neuroprotective function against age-dependent deficits has renewed interest in a long series of studies initiated in the early 1960s showing that exposure to enriched or impoverished environment has a remarkable impact on the brain ranging from molecular to anatomical and functional changes.

Interestingly, knowledge about experience-induced plasticity provides stimulating insights into the neurobiological foundations of cognitive skills and school learning, and offers new perspectives in the field of cognitive remediation.