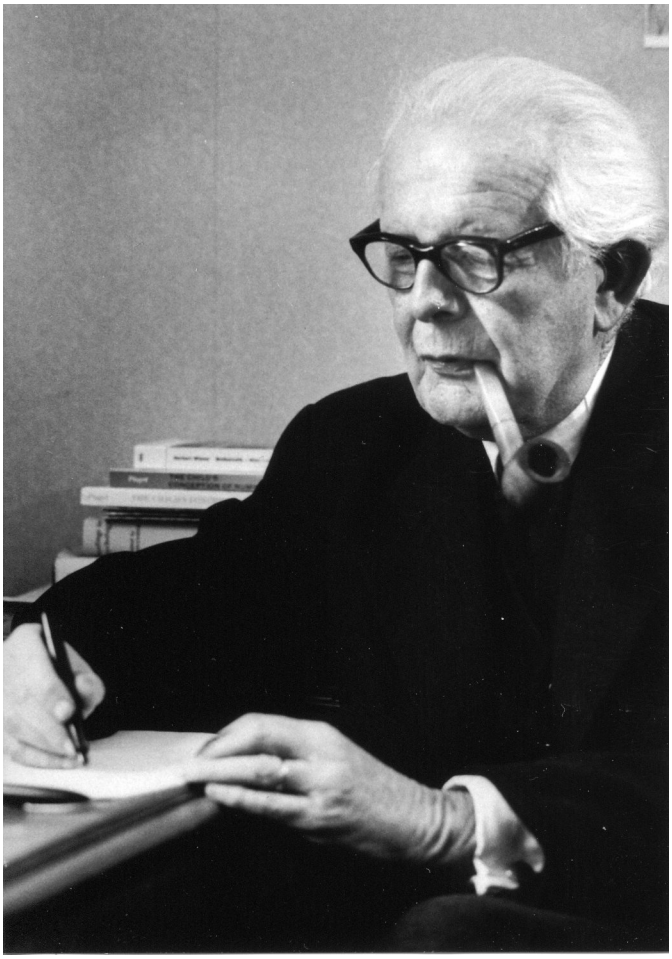
Landenberg, 1965

"La caractéristique la plus frappante de Piaget me paraît être son désir constant de découvrir des données nouvelles et d'élargir sa vision de la connaissance (…). Pour lui, la joie de découvrir a été un des moteurs puissants de sa recherche."

BÄRBEL INHELDER

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WELCOME AND SPECIALS THANKS

We warmly welcome you to the 2nd Jean Piaget Conferences. We would like to thank Richard ASLIN, Renée BAILLARGEON, Paul BLOOM, Andrew MELTZOFF, Thierry NAZZI, Olivier PASCALIS, Elizabeth SPELKE and Karen WYNN who kindly accepted to give a lecture. We wish everyone a pleasant and fruitful conference and hope that you will enjoy your stay in Geneva.

We are indebted to the following institutions for their support: University of Geneva, Faculty of psychology and sciences of education of Geneva, Swiss National Science Foundation, Société Académique of Geneva.

Pierre Barrouillet, Director of the Archives Jean Piaget

NOTE FROM THE PRESIDENT OF THE ARCHIVES JEAN PIAGET

The Archives Jean Piaget aim at keeping Jean Piaget's work active and preserving it. Publications pertaining to the Piagetian thought or continuing it are gathered together in a documentation center. This data base is available online. In 2012, the foundation has received an important donation funds from the descendants of Jean Piaget, including all that was in his office. Aside from this documentary activity, the Jean Piaget Conferences aim to regularly update the Piagetian heritage in several psychological and epistemological domains.

Pierre-Yves Brandt

JEAN PIAGET'S LIFE

Piaget was born in 1896 in Neuchâtel in the French-speaking part of Switzerland and died in 1980. During his youth, he developed an interest in biology and the natural world, but also in philosophy, metaphysics and even theology. Piaget received a PhD in natural science from the University of Neuchâtel, and also studied briefly at the University of Zürich. He then moved to Paris to join Alfred Binet's laboratory, where he worked on his first theory of children's cognitive development. In 1921, Edouard Claparède hired him as Director of Rousseau Institute in Geneva. Since then, Jean Piaget spent most of his career in Geneva, with some time in Neuchâtel, Lausanne and Paris. Jean Piaget brought to psychology a complete change in the way we understand children's thinking. His work in genetic psychology and epistemology focused on how knowledge develops. He found evidence that children's logic develops progressively to adulthood, according to its own laws and evolving throught distinct stages.

THE ARCHIVES JEAN PIAGET

The Foundation of the Archives Jean Piaget was created in 1974 by Professor Bärbel Inhelder at the University of Geneva and from the beginning has been supported financially by the State of Geneva. Its mission is to collect the writings of the father of genetic epistemology, as well as the scientific output from research in developmental cognitive psychology conducted in Geneva. It is vital to preserve and spread this important scientific heritage. During the '60s, researchers began to establish a complete bibliography of Piaget's work. Although quite diverse, ranging fom poetry to philosophy, pedagogy, and botanics, this extensive bibliography shows the uncanny unity of Piaget's thought.

The Foundation Archives Jean Piaget organizes several scientific activities. Among others, a weekly pluridisciplinary seminar and a series of biannual conferences, the aim of which is to bring together the best specialists of a domain particularly relevant to Jean Piaget's work.

THE JEAN PIAGET CONFERENCES

The Jean Piaget Conferences are aimed at students, researchs and scholars interested in Piaget's work and theory. Althought being primarily centred on developmental and cognitive psychology, the Jean Piaget Conferences can also be of interest for a larger audience interested in child development, education, epistemology and cognitive science. The conference reunites outstanding researchers in the general domain of cognitive psychology, focusing each time on a more specific theme relevant to the oeuvre of Jean Piaget. The format of the conference is that of an advanced course, where invited speakers contribute a one-hour presentation on their own domain of competence. This biannual event affords the unique opportunity for advanced students and scholars to keep abreast with the most recent advances in the chosen domain.

The theme selected this year for the 2nd Jean Piaget Conferences is the first month of life. This particular theme was motivated by the recent acquisition of the notebooks written by Jean and his wife Valentine and relating the early development of their three children, the very same notebooks that eventually laid the ground for the trilogy of books on sensori-motor development and on birth of intelligence in children ("The origins of intelligence", "The child's construction of reality" and "Play, dreams and imitation in childhood"). These invaluable documents have remained in Piaget's estate in Pinchat until recently, when they were bequeathed by the family to the Archives along with all Piaget's manuscripts. In parallel with the conference, an exhibition of the notebooks will be held to celebrate this important acquisition.

The Jean Piaget Conferences **"Infant development from Piaget to today"** were designed to offer to students and researchers a comprehensive survey of the contemporary theories of cognitive and social development, most of which emerged in relation and sometimes in oppositions to the Piagetian approach. At the same time, we wished to provide an arena where these different lines of research can be assessed and debated.

PROGRAM

Monday, June 20, 2016 - Morning

8h45	Introduction to the 2nd Jean Piaget Conferences
9h00	**MELTZOFF, ANDREW** *Imitation in Infancy: Developing A Post-Piagetian Theory*
10h00	Coffee break
10h30	**SPELKE, ELIZABETH** *Core knowledge and the development of intelligence: A perspective on Piaget's theory*
11h30	**POSTER SESSION**
12h30	Lunch

Monday, June 20, 2016 – Afternoon

14h00	**NAZZI, THIERRY** *Early developmental trajectory of a phonological bias in lexical processing*
15h00	Coffee break
15h30	**ASLIN, RICHARD** *Mechanisms of learning during infant development: The role of distributional information*
16h30	**RATCLIFF, MARC** *The birth of a theory. Evidence from the Jean and Valentine Piaget's notebooks*

17h30 RECEPTION FOR THE OPENING OF THE EXHIBITION ENTITLED **« DE L'OBSERVATION À LA THÉORIE: LES CARNETS D'OBSERVATIONS DE JEAN ET VALENTINE PIAGET »**

Tuesday, June 21, 2016 - Morning

9h00 **PASCALIS, OLIVIER**
Infant memory or infant memories?

10h00 Coffee break

10h30 **BLOOM, PAUL**
Just Babies: The origins of a good and evil

11h30 **POSTER SESSION**

12h30 Lunch

Tuesday, June 21, 2016 - Afternoon

14h00 **WYNN, KAREN**
The roots of Morality: Early social judgments in infancy

15h00 **BAILLARGEON, RENÉE**
Early Sociomoral Reasoning

16h00 Closing speech

KEYNOTES ABSTRACTS

Monday, June 21, 2016 - Morning

ANDREW MELTZOFF

University of Washington

Imitation in infancy: Developing A Post-Piagetian Theory

Imitation is a key mechanism of human learning. Human infants use imitation of adults to learn about physical objects, causal relations, and cultural practices. Infant imitation requires a close mapping between action perception and action production. This mapping can now be described at both the psychological level, and increasingly at the neural level. In this talk I will outline the "Like-Me" hypothesis. It proposes that one of the infant's first and most basic psychological acts is the recognition of others who act, move, and behave like the self. This theoretical proposal, based on behavioral studies, is aligned with emerging findings in developmental cognitive neuroscience. My recent work investigates the neural correlates of infant imitation, using EEG and MEG to examine action coding and neural body maps. I will discuss infants' representation of human action, the impact of early self-other mapping in infants' understanding of people, and mechanisms of change in social-cognitive development. Finally, I will examine the how modern findings about infant imitation relate to Piaget's original theory of sensorimotor intelligence, considering Piaget as an ancestor for current views about imitation and the origins of social cognition.

ELIZABETH SPELKE

Harvard University

Core knowledge and the development of intelligence: A perspective on Piaget's theory

Over the course of cognitive development, Piaget argued that children develop new and more powerful concepts. These concepts, he maintained, emerge neither through associative learning nor through the blind unfolding of maturational processes, but rather through constructive processes that build on experiences tracing back to infancy. This position was criticized in the 1970s and 1980s, by cognitive scientists who argued against the very possibility that more powerful concepts could be constructed on the basis of less powerful ones (e.g., Fodor, 1975). Here I suggest that Piaget's picture of conceptual development in childhood prevails over those arguments, and that apparent contradictions in his theory disappear if it is viewed in light of subsequent research on cognition in infancy. Piaget underestimated the perceptual and cognitive capacities of infants: capacities that came to light long after his own seminal studies. Thus, many of his claims concerning the initial cognitive competences of infants were mistaken, but his more central theory of conceptual development may well be correct. I review some key findings concerning infants' conceptual capacities and then focus on new evidence supporting a version of his claims for conceptual change in the domain of number.

Monday, June 20, 2016 - Afternoon

THIERRY NAZZI

University Paris Descartes

Early developmental trajectory of a phonological bias in lexical processing

Nespor et al. (2003) proposed a functional dissociation in language processing, according to which consonants would be given more weight than vowels in lexical processing, and vowels would be given more weight than consonants in prosodic/syntactic processing. Accordingly, we investigated the proposed consonant bias at the lexical level both from a crosslinguistic and developmental perspective. Crosslinguistically, the C-bias was found to be pervasive in French and Italian, while a different pattern wase found in English (late emergence of the C-bias) and in Danish (observation of a V-bias). This variation suggests that the originally proposed C-bias is language-modulated. Developmentally, lexically-related studies focusing on French-learning infants between 5 and 11 months suggest that these infants switch from an early V-bias around 5/6 months of age to a functional C-bias around 8/11 months. We will discuss these findings in relation to early phonological and (pre)lexical developments.

RICHARD ASLIN

University of Rochester

Mechanisms of learning during infant development: The role of distributional information

Classic views of the sensory-motor period during infancy emphasize the role of action in discovering structured information in the environment. While there is no question that action is a powerful tool for learning, research in the past two decades has revealed another powerful tool - the extraction of structure from the environment by mere exposure. That is, observation of events that contain either temporal or spatial structure as defined by the distribution of elements within those events can lead infants to learn those structures, despite no overt action on the part of the infant. It has been argued that these demonstrations of "statistical learning" in infancy are limited because they do not generalize to novel events (i.e., they are not rule-based). I will argue that this conclusion is unwarranted – the patterning of the input enables a learner to either generalize or to treat the specifics of the input as unique (i.e., as exceptions rather than rules). In turn, the contrast between learning the input and generalizing from it can serve to bias future learning, thereby enabling the transition to a more mature developmental level.

Tuesday, June 21, 2016 - Morning

OLIVIER PASCALIS

University Pierre Mendès-France, Grenoble

Infant memory or infant memories?

The contrast of early experiences being fundamental to a child's social, emotional and cognitive development and the fact that most adults report very few memories from before 2- or 3-years of age has created a massive literature. It has been suggested for a long time that only procedural memory was present during the first years of life. The neural network supporting explicit memory being immature the young infant may be unable to store "episodic" information in an accessible form. Twenty years ago, Nelson (1995) has proposed that, in primates, both memory systems are present at birth, although the declarative system may exist in an immature form, referred to as pre-declarative memory, due to the immaturity of cortical inputs to the hippocampus. I am going to review the literature and argue that childhood amnesia is a complex issue in which the development of several cognitive functions interfere with the brain maturity.

PAUL BLOOM

Yale University

Just Babies: The origins of good and evil

One of the most surprising discoveries in contemporary developmental psychology is that babies apparently possess a rich moral sense. They distinguish between good and bad acts and prefer good characters over bad ones. They feel compassion for others, and even possess a primitive sense of fairness and justice. Based on these findings, many scholars have argued that the difference between baby morality and adult morality is slight—a matter of degree, not of kind. I will suggest that this is mistaken. It turns out that the morality of a baby has a very different character than that of an adult. In some regards, it is *better*. Certain intuitions that only adults possess, having to do the moralization of purity and disgust, make us worse people—we were better off as babies. In other regards, though, our innate morality is limited, tragically so. Piaget and Kohlberg were correct to maintain that an impartial and disinterested moral system—one that takes the perspective of an "impartial spectator"—is the product of a lengthy developmental process. There is an important sense, then, in which we are not moral from the very start.

Tuesday, June 21, 2016 - Afternoon

KAREN WYNN

Yale University

The Roots of Morality: Early social judgments in infancy

As members of a highly social species, humans must be able to evaluate the actions and intentions of the people around us, to identify our allies and adversaries and to make accurate decisions about who is likely to be a trustworthy social partner and who is not. Even in the first few months of life, these processes are vigorously operative in young humans: infants evaluate others on the basis of their actions and intentions towards third parties. These judgments share some of the features of mature moral judgments, and thus may form the developmental foundations of our rich system of moral cognition.

RENÉE BAILLARGEON

University of Illinois

Early Sociomoral Reasoning

What sociomoral principles guide early expectations about interactions among individuals? My presentation will focus on four candidate principles: fairness, harm avoidance, ingroup support, and authority. In our experiments, infants and toddlers watch third-party interactions among unfamiliar individuals. Following the minimum-group paradigm, group memberships are specified using salient markers such as novel labels or outfits. Our experiments examine (a) what expectations infants and toddlers possess with respect to each principle, (b) how these expectations interact in situations where two or more principles apply, and (c) how children's experience with their particular socio-cultural environments affects these initial expectations and interactions. Together, our results suggest that a rich and abstract capacity for sociomoral reasoning emerges early in development.

POSTERS ABSTRACTS BY TOPIC

EDUCATION

1. Raisonnement abductif em mathémathiques à l'école primaire

Del Notaro[1], C.

[1]Fpse, University of Geneva

Nous tentons de cerner de quelle manière les connaissances mathématiques se construisent chez des élèves de 11-12 ans. Pour ce faire, nous utilisons une méthodologie originale qui s'appuie sur la narration après-coup par l'expérimentateur, d'interactions de connaissances ayant eu lieu entre un élève et lui-même, puis nous analysons ces narrations pour y déceler les inférences logiques activées. Comment l'élève procède-t-il? Notre poster a pour ambition d'exposer la manière dont la narration met en évidence les connaissances manifestées. Notre fil conducteur est l'expérience effectuée par des élèves et des étudiants futurs enseignants primaire. Les prises de décisions mutuelles procèdent toujours d'un savoir mathématique, c'est-à-dire que les réponses sont données à partir de ce que l'objet mathématique provoque en termes de connaissances. Dès lors, nous recherchons le fait surprenant permettant l'émergence d'un raisonnement abductif chez l'élève. Par exemple, si Piaget considère l'abduction comme faisant partie intégrante de l'accommodation; nous nous référons à Peirce (1931-1935) pour la définir comme une inférence logique découlant d'une surprise mathématique. Cette surprise peut être de nature diverse en fonction du développement de l'élève; prenons par exemple la parité du nombre. Cette notion engendre des confusions chez l'élève, qui va produire une réponse procédant de ce savoir: *« Est-ce que 222222245 est pair ou impair? »* l'élève répond *« pair, parce qu'il y a plus de chiffres pairs que de chiffres impairs »*. Cette assertion montre une confusion des règles, une réminiscence d'une règle antérieure, qui veut qu'un nombre pair se termine par un chiffre pair. L'abduction consiste ici à créer une nouvelle règle, proche, montrant ainsi la déstabilisation.

A hauteur d'un élève de 11-12 ans, l'abduction ne conduit que rarement à un résultat exact, c'est pourquoi nous ne prenons pas en compte la question de l'accommodation.

Keywords: Expérience – Interactions de connaissances – Abduction – Didactiques des mathématiques – Elèves de 11, 12 ans

2. The assumption of an active methodology in Piagetian perspective

Mano[1,*], A. & Saravali[1], E.

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[*]Corresponding author

Genetic Epistemology, the theory proposed by Jean Piaget, takes the well-known idea that knowledge is constructed through an interaction between subject and object. This means that the quality of these interactions and the cognitive tools that the subject has, leads to different and gradual ways of understanding the logical-mathematical, physical, and social world. Through this design, we do procedures in the school environment, which, par excellence, should promote the construction of knowledge in a more elaborate way and anchored in the active role that individual needs to take. It is in this sense that the Piagetian ideals highlight the importance of active methodologies in schools. Given the above, this work, of bibliographic nature, aimed to visit the active methodology idea in Piaget's book *Psychologie et Pédagogie*, highlighting its main assumptions. Briefly, some key points of this work are featured to describe an active methodology, such as the need for educators to know the importance of subjects in taking an active role in the construction of knowledge. From this, it states the needed course of action of deterring from school lessons that are taught only verbally, and manipulating scheduled lessons without reflection. Thus, this discussion has attempted to list briefly the contributions of Genetic Epistemology theory in teaching, and also highlights the legacy and relevance of Jean Piaget.

Keywords: Active methodologies – Genetic epistemology – Jean Piaget

INFANCY

3. Intermodal recognition of emotions (audio – visual): contributions of the analysis of eye movements during decoding of emotional facial expressions in babies aged of 6 months

Humair[1], I., Roux[1,*], A., Malsert[1], J., & Gentaz[1], E.

[1]Sensorimotor, Affective and Social Laboratory (SMAS), University of Geneva
*Corresponding author

To study the nature (semantic and/or pictorial) of emotion recognition, we designed this study to examine if emotional information could be transferred from auditory modality to visual modality in infants aged of 6 months. In order to do that, sequences of intermodal transfer were individually proposed to 22 infants (M=6 months) being familiarized to an emotional prosody (happy or angry) or neutral for 20 seconds, followed by 2 facial expressions, one being a congruent facial expression and the other one being a non-congruent facial expression with the voice, presented simultaneously during 10 seconds. The analyses of visual preferences were performed with an eye-tracker (SMI RED 250).

Keywords: Emotion – Emotional expression – Baby – Eye tracker – Intermodal transfert - Amodal

4. Intermodal recognition of emotions (audio – visual): a longitudinal study in babies aged of 1, 2, 4 and 6 months

Roux[1, *], A. & Gentaz[1], E.

[1]Sensorimotor, Affective and Social Laboratory (SMAS), University of Geneva
[*]Corresponding author

To study the nature (semantic and/or pictorial) of emotion recognition, we designed this study to examine if emotional information could be transferred from auditory modality to visual modality. To observe any developmental trajectory we proposed the same sequence at each ages, 1, 2, 4 and 6 months old. In order to do that, the sequences of intermodal transfer were individually proposed to 10 infants being familiarized to an emotional prosody (happy or angry) or neutral for 20 seconds, followed by 2 facial expressions, one being a congruent facial expression and the other one being a non-congruent facial expression with the voice, presented simultaneously during 10 seconds.

Keywords: Emotion – Emotional expression – Baby – Development – Intermodal transfert - Amodal

5. The Trusting Two's: Humans' Strong trust in communication increases during the second year of life

Mascaro[1, *], O. & Kovacs, A.

[1]Institute for Cognitive Science Marc Jeannerod (Lyon, France) – CNRS: UMR5304
[*]Corresponding author

In many situations, humans accept what is communicated to them, even when informants are complete strangers who could be mistaken or lying. Where does this trust come from, and how does it develop? Although raised more than two centuries ago by philosophers (Hume, 1748; Reid, 1764) this question is still unanswered. To address it, we turn to the very early developmental stages of trust in communication. We probe the strength of infants' trust with a hiding game in which participants have to find a toy hidden under one of two buckets. In the crucial test condition, participants first see where the toy is hidden, and later an informant points to communicate to them that the toy is in the other bucket.

In Study 1, we find that 15- and 24-month-old infants are more likely to follow pointing than to trust their past perception ($p < .001$, One Sample Wilcoxon Signed Rank Tests), even when the informant has a false belief about the location of the toy. Moreover, we observe that trust in communication increases with age ($p = .001$, Mann-Whitney U test). In subsequent studies, we confirm that infants' do not following pointing because they want to comply with the experimenter (Studies 2 and 3). Infants' trust extends to novel communicative signals (Studies 4 and 5). However, it is found only when novel signals are presented in an ostensive manner (Study 6).

These results indicate that, from infancy on, the recognition of intentions to communicate triggers a disposition to accept information that is strong enough to override past perception. Perhaps surprisingly, this strong trust increases during toddlerhood, instead of decreasing with time. Increased communicative abilities and opportunities to learn from others could support the "Trusting Twos", a developmental stage of heightened trust in communicated information.

Keywords: Trust – Communication – Pragmatics – Theory of mind

6. Infants' psychological principle of non-contradiction: Precocious expectations about the consistency of goals and beliefs within a mind

Mascaro[1,*], O. & Kovacs[1], A.

[1]Institute for Cognitive Science Marc Jeannerod (Lyon, France) – CNRS: UMR5304
[*]Corresponding author

Two studies test infants' grasp of what we call the "psychological principle of non-contradiction". This principle specifies that a single mind is unlikely to maintain contradictory beliefs or goals, i.e. mental states co-referring to the same state of affair, while having mutually exclusive contents.

Study 1: Expectations about the consistency of goals.

In a looking-time study, 9-month-olds evidence a stronger tendency to expect two hands to belong to two people when one of these hands prevent the second one from achieving her goal, than when these hands exhibit the same pattern of movements without identifiable goal. Therefore infants expect that a single individual is unlikely to aim for 'p' and 'not-p' at the same time.

Study 2: Expectations about the consistency of beliefs.

In Study 2, fifteen-month-olds have to find a toy hidden in one of two locations, using the pointing of adult informants. When a single informant points successively to two different locations to indicate the toy's location, 15-month-olds follow her second pointing. Infants seem to recognize that the informant changed her mind, and is unlikely to disagree with herself (by believing a single toy to be in two different locations). Infants' tendency to trust the second pointing is reduced when the first and the second pointing are produced by two different informants. Infants appear to assume that the two informants maintain contradictory assertions about the toy's location, presumably because they recognize that two different people can have contradictory beliefs.

These studies suggest that infants appeal to a psychological principle of non-contradiction. This expectation of consistency serves to set the boundaries between minds. It is also crucial to support representations of others' extended practical and epistemic agency, for example supporting the integration of multiple goals over time, or the representation of others' inferences.

Keywords: Theory of mind – Reasoning – Infant development

LANGUAGE

7. Language at 3 years in monolingual French-speaking children: How early can it be predicted, and by which measure?

Patrucco-Nanchen[1,*], T., Béguin[1], C., Alaria[1], L., Friend[2], M., Poulin-Dubois[3], D., & Zesiger[1], P.

[1]Fpse, University of Geneva
[2]San Diego State University
[3]Concordia University
[*]Corresponding author

The aim of the current study is to test the predictive power of various language measures which have been argued to predict later language development. For this purpose, a group of 65 French-speaking children have been tested at 16, 22, 29 and 36 months. At ages 16 and 22 months, the toddlers were tested with a parental report (French adaptation of the MCDI; Kern, 1999), the Computerized Comprehension Task (CCT, Friend & Keplinger, 2003), and a Novel Word Learning Task based on Woodward et al. (1994). At age 29 months, language was assessed using the MCDI, a pseudoword repetition task (PWRT), two standardized tests tapping lexical and grammatical comprehension (Khomsi, 2001), and spontaneous language sample recorded in a free play situation. At the age of 36 months, language outcome was assessed by a Sentence Repetition Task (Devescovi & Caselli, 2007), the French adaptation of the Peabody Picture Word Test (Thi´erault-Whalen & Dunn, 1993) and a standardized test of Picture Naming (Chevrier-Muller & Plaza, 2001).

A factorial analysis was performed with the 3 language outcome measures and a single factor was extracted representing 59.6% of the variance. This factor was used as the dependent variable in a hierarchical regression analysis in which the different variables measured at the first three waves were entered step by step. Results show that at 16 and 22 months of age, the CCT is a strong contributor of language outcome at 3 years (respectively $R2\ \Delta = .194$ and $R2\ \Delta = .294$). At 29 months, the performance at the PWRT ($R2\ \Delta = .101$), and the MaxMLU based on the MCDI ($R2\ \Delta = .066$) add a significant contribution to the explained variance.

These results suggest that direct measures of early lexical comprehension can efficiently contribute to explain language skills at 3 years of age.

Keywords: Language development – Early comprehension

8. The role of bilingual experience on categorization of perceptually similar objects at 30 months

Havy[1, *], M., Overney[1], C., Carroz[1], P., Page[1], J., Chelihi[1], F., Jaggie[1], C., & Zesiger[1], P.

[1]University of Geneva
[*]Corresponding author

A growing body of evidence documents that naming guides infants as they organize their visual experiences into categories. By well before they begin to speak, infants use naming to highlight equivalence between objects that are otherwise considered very distinct or impose a category distinction that is not readily perceptible. Recent evidence indicates that bilingual experience influences how infants trace the relation between words and objects. Here, we ask how bilingual experience influences children's use of naming as they form categories along a perceptual continuum.

To address this question, we introduced 30-month-old monolingual (n=41) and bilingual children (n=12) to a continuum of creature-like objects. At learning, children saw the poles of the continuum (Standard A, Standard B): one was moving to the left and the other to the right. These objects were presented either in silence ('silence' condition) or with two distinct names ('two-name' condition: Standard A – 'bup', Standard B – 'var'). At test, children saw a series of new individuals (5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%) in silence. At issue was whether children were able to anticipate the side to which new objects from the continuum would move and whether naming affected this capacity.

Results indicate that in the 'silence' condition, the perceptual continuum was perceived as a broad category: children were unable to anticipate the side of object appearance. In the 'two-name' condition, monolingual and bilingual children were able to identify two distinct categories and anticipate the likely appearance of the objects. However, and contrary to their monolingual peers, bilingual children did not have strong expectations about the placement of category boundaries. This finding suggests different patterns of categorization in monolingual and bilingual children, which will be discussed in line with broader research.

Keywords: Language – Object categorization – Anticipatory looking – Bilingualism

9. Piagetian assimilation and developmental phonetics

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Via *assimilation*, children's past experience supports cognition and behavior in sometimes surprising ways. In one example from Piaget and Inhelder (1948), a child was shown a triangle and asked to copy it. With deliberation she drew a square, then added pointy embellishments, clearly having started by assimilating the visible triangle to the geometric schema "square". In another example, DeLoache and colleagues (1994) found that after children played with a body-sized car or chair, they attempted similar actions with miniscule toy versions, assimilating present experience to past categories despite the manifest impossibility of doing so successfully. "Assimilation" has also been invoked to explain infants' behavior in speech perception experiments. Sounds that infants once differentiated become indistinct over development, assimilated to learned native-language categories (e.g. Best, 1994; Kuhl et al., 2008). I will suggest that while this conceptualization of infants' performance in experiments is accurate, the corresponding *accommodation* process, by which the categories are learned, does not resemble the experiments at all, and requires an entirely different conceptualization of what accommodation entails. Children do learn categories, but to do so, they must also learn interpretive models, or schemas, to structure this learning. This is because in language, children must allocate explanatory force to multiple overlapping sources, which are sometimes categorical in nature, but which combine in extremely complex ways. The assimilation process must work not only over categories, but also over how those categories interact. Using several recent experiments and new data from my lab, I will describe what we know about how categorization (assimilation) and learning (accommodation) interact adaptively, over the developmental course. The results are consistent with Piaget's contention that assimilation and accommodation are not distinct processes, but rather "les deux pôles fonctionels, opposés l'un à l'autre, de toute adaptation" (Piaget, 1967, p. 244).

Keywords: Phonetics – Perception – Learning – Interpretation - Categorization

10. Severe speech and language impairment in a child with SETBP1 de novo variant

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BACKGROUND: The SETBP1 gene has recently been postulated to be in direct relation with severe expressive speech impairments, intellectual disability, fine motor difficulties, hyperactivity and subtle dysmorphisms (Barnett & van Bon, 2015).

AIM: this single case study aims to provide cognitive profile and specifically speech and language analysis of a child presenting a SETBP1 *de novo* variant.

METHOD: Neuropaediatrical and neuropsychological assessments in a 5 year-old girl were performed through clinical and standardised protocols. Outcomes were qualitatively analysed through normative data and SDs.

RESULTS: Subtle dysmorphisms were observed at the neuropaediatric evaluation. The neuropsychological assessment revealed a severe expressive language disorder, characterised by fluent but unintelligible jargon, articulatory deficits and severe phonological programming impairments. There was no oromotor apraxia. Understanding was clinically preserved but formal assessment revealed a mild delay in lexical and morphosyntaxic receptive development. Evaluation also documented a mild global cognitive delay, attention/hyperactivity disorder and mild to moderate motor impairments (coordination, fine motor skills and drawing).

CONCLUSIONS: Our case study contributes to the characterization of the type of expressive language deficit related to SETBP1 (Marseglia et al., 2012). We argue that this gene may be involved specifically in the phonological programming skills, mutations being associated to disorders ranging from phonological programming impairments (but fluent speech) to complete verbal apraxia.

11. Dyslexics' reading dynamics reflects the dynamics of their neural adaptation to sounds

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Dyslexia is a widespread reading disability associated with poor working memory and often with impaired auditory discriminations. Being a deficit in a uniquely-human task, its neural mechanisms are not understood. We now aimed to decipher these mechanisms, inspired by a computational model which explains dyslexics' auditory difficulties as a deficit in automatic integration of sound statistics. We characterized the dynamics of this integration behaviorally and neurally. Behaviorally, we found that dyslexics' reading benefit from an exposure to a new word decays faster than controls' and that the effect of sound statistics also decays faster in simple sound-discriminations. Neurally, we found that the response elicited by dyslexics' auditory cortex is adapted for a shorter duration than controls'. Importantly, behavioral context effects and neural adaptation have the same time constants. We propose that dyslexics' shorter adaptation paradoxically accounts for their elevated reading duration since it induces noisier and less reliable sound predictions. Tapping the underlying neural basis of dyslexia paves the way for early diagnosis of this prevalent learning disorder even before reading age. Such early detection might lead to efficient early interventions which would prevent the "snow-ball" of frustration often associated with failure in initial stages of learning to read.

Keywords: Dyslexia – Learning disorders – ERP - Perception

NUMERICAL COGNITION AND SPATIAL ORIENTATION

12. Mental addition in children: A longitudinal approach

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It is admitted in the literature that from the age of 10, children are able to solve most of simple additions problems by retrieval of the answer from long-term memory. In other words, in order to solve the addition 6 + 5 for example, they would not have to decompose the problem into 5 + 5 + 1 or to count one by one from the larger operand, but they would directly retrieve the answer 11. However, we have recently shown that adults still resort on fast and unconscious counting procedures in order to solve very simple additions such as 2 + 3 (e.g., Barrouillet & Thevenot, 2013; Thevenot, Barrouillet, Castel, & Uittenhove, 2016). It is then quite improbable that children could retrieve results of simple addition problems. In our study, we aim at investigating the development of strategies used by children to solve such problems and reconsidering the view that retrieval constitutes the main strategy to solve simple addition problems at the age of 10. Children aged from 8 to 9 have been tested on their ability to solve one-digit additions. The same children have been retested one year later. Not surprisingly, solution times measured the first year of testing varied as a function of the size of the operands, which indicates that children still resort on slow counting procedures to solve one-digit additions. More interestingly, when retested one year later, children's solution times were reduced, but slopes associated to the size of the first and to the second operand remained significant. Moreover, these slopes were more important in children with low than with higher working memory capacities. Rather than a shift from counting procedures to retrieval, these results suggest an acceleration of procedural strategies through development until their automatization.

Keywords: Numerical cognition – Counting procedures

13. Path integration in children 5 to 12 years old

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Path integration (Mittelstaedt & Mittelstaedt, 1980) is the cognitive process through which mobile organisms, from ants to humans, can keep track of their location while locomoting, only on the basis of sensory information generated from within the organism during locomotion. This is the process which is used, for example, when walking in a totally darkened room and trying to return to the door through which one entered the room.

Though this was suggested as early as the 90s, it has only recently become clear that this process is extremely important, as in mammals it contributes to building a seamless representation of the environment during exploration, the cognitive map (Tolman, 1948). Recent work in animal neuroscience has shown, down to the neuronal level (e.g. McNaughton et al., 2006), that path integration constantly updates the allocentric spatial representation, in particular in a new environment where landmarks are still to be learned.

Adults demonstrate capabilities for path integration (e.g. Loomis et al., 1993). As it is a crucial element in spatial processing, and spatial competence develops with age (Piaget & Inhelder, 1948), it is important to know how path integration itself develops during childhood. Curiously, almost nothing has been published on this subject: to our knowledge, only Smith et al. (2013) tested blindfolded 5 and 7-yr old children, and this over very short (1 m on a side) L-shaped journeys.

To get a clearer picture of its ontogeny, we tested blindfolded 5 to 12-yr old children over journeys extending up to 6 x 6 m. In addition, we analytically explored various capabilities underlying path integration: the estimation of distances, the estimation of rotations, and the combination of both. The results indicate that path integration follows a general developmental path across those ages, but that errors are due to different reasons at different ages.

Keywords: Path integration – Development – Spatial orientation

NEURODEVELOPMENTAL DISORDERS

14. Sense of time in neurodevelopmental disorders: neuropsychological profiles of dyschronia

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Dyschronia can be described as a disorder affecting the sense of time and temporal organisation. Clinically, it can manifest as difficulties locating oneself in time, to grasp the concept of time or to estimate objective and subjective duration. Time perception and temporal organisation are important aspects of our daily life that help us organize our experiences. Therefore impairments of these processes can lead to disorientation and increase stress and anxiety. Furthermore, in adolescence, conceptualizing time and manipulating it is the key to independent living (e.g. arriving on time at school, meeting up with friends). In development, dyschronia is rarely seen by itself. Indeed, deficits in time perception and processing were reported in children with attention deficits (ADHD) suggesting a link between executive functions and time processing (Barkley, Koplowitz, Anderson, & Mcmurray, 1997). Although it is an understudied topic in the literature, our clinical experience indicates that dyschronia, is often associated to developmental dyscalculia. Interestingly, sense of time has been related to prefrontal cortical function (Lewis & Miall, 2006) and/or fronto-striatal networks (cognitive time perception) but also to parietal cortices (Walsh, 2003) (global magnitude processing). Hereby we set out to investigate neuropsychological profiles of patients presenting with dyschronia to identify different pattern of difficulties. The aims of this work were (1) study comorbidities of dyschronia and (2) explore the heterogeneity of clinical profiles and their cognitive specificities. Thus we postulate that at least two different neuropsychological profiles may be observed: one affecting mainly magnitude processing (i.e. sense of number and time resulting in the association of developmental dyscalculia and dyschronia). The other pattern affecting mainly prefrontal function (i.e. working memory, executive function and dyschronia. We will report different neuropsychological profiles of patients with dyschronia.

Keywords : Neurodevelopment disorders - Dyschronia - Neuropsychological profile

15. Face-inversion effect in 22q11.2 deletion syndrome (22q11.2DS)

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Background

Previous literature has shown a disruption of configural (CFP), but not featural face processing (FFP) during the perception of inverted faces in typically developed individuals (TD). Therefore, TD had more difficulties to recover configuration, rather than features from rotated faces. Moreover, patients with neurodevelopmental disorders (e.g., Down and Williams syndrome), do not appear to display this pattern. The current study investigated the face inversion phenomenon in 22q11.2DS. First, we expected that impairments in CFP would result in a reduced face-inversion effect in the 22q11.2DS group, whereas reliance on CFP would result in disrupted perception of inverted faces in TD. Second, we aimed at identifying visual scanpaths during inverted face processing using eye-tracking technology.

Method

71 individuals with 22q11.2DS and 81 TD (aged 6-21 years old) participated in our study. A face discrimination task (”Jane Task”) in which participants had to identify configural and featural differences between upright and inverted faces was administered on a Tobii 1750 eye-tracker. The main variables were: accuracy data, first fixations and percentage of time spent on face features.

Results

Behavioral results showed a reduced inversion effect during CFP in 22q11.2DS. However, the inversion effect was present during FFP in 22q11.2DS and during both FFP and CFP in TD. Preliminary eye-tracking data showed that patients spent less time on the eyes than TD during inverted and upright face processing, and more time on the mouth only in the upright condition. Results also showed that 22q11.2DS are less likely to start exploration from the eyes, than TD.

Conclusion

To our knowledge, this is the first study investigating the face-inversion effect in 22q.11.2DS.

Keywords: Face processing - Face - Inversion effect - Configural face processing - Featureal face processing - 22q11.2 deletion syndrome

16. Social evaluation in young children with Autism Spectrum Disorder (ASD): an eye-tracking study

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Studies using different paradigms including puppets or animated geometric shapes have shown that, from the age of 6 months, typically developing (TD) infants show a clear preference for prosocial agents (Hamlin et al., 2007; Hamlin & Wynn, 2011). These studies demonstrate that the attribution of a social meaning and tendency to prefer prosocial agents emerge quite early. The extent to which these abilities are impaired in individuals with ASD remains unclear. For instance, high functioning adults watching animated geometric shapes enacting a social plot (e.g. the Social Attribution Task) tend to produce descriptions in physical terms (e.g. gravity), whereas TD individuals predominantly attributed social meaning (Klin, 2006). Here, we examined the performance of the children with ASD in a social attribution task, developed for preverbal children. We showed the ”hill paradigm” video (courtesy of Hamlin; see Hamlin 2007, 2015) to 27 children with ASD (aged 3.52±1.01) and 15 controls (aged 2.67±0.74). A one-minute film depicts the protagonist (red circle) being helped/hindered by one of the two agents (square/triangle). After this habituation phase, both agents were presented simultaneously on the screen. We measured the fixation preference using a Tobii eye-tracker device. Both the ASD and TD group looked more at Helper than Hinderer: 81% children in ASD (21/26) and 57% (8/14) in TD group. This preference was only significant in ASD group (ASD: p = .001, TD: p = 0.503). Despite aforementioned findings, our results demonstrated strong preference for Helper in ASD group, this preference being surprisingly more pronounced than in TD group. As the used task was validated for children aged 6 and 10 months, it is possible that it was too basic for the TD children. The persistence of a strong preference in ASD group might reveal a more simplistic understanding of the social scene.

Keywords: Social attribution task - ASD - Prosocial behavior - Social cognition

17. Effect of emotional expressions on joint attention responses in young children with ASD

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The ability to follow the direction of the gaze/gestures of others in order to share attention (responding to joint attention behaviors, RJA) is reduced in young children with autism spectrum disorders (ASD, Mundy et al. 1986). RJA are considered as one of the first identifiable signs for ASD and they play a key role in the early development of social-communication skills. For this reason, RJA is a compelling target in early intervention programs for young children with ASD (Rogers et al. 2012). Clinical guidelines suggest that exaggerating facial expressions or adding a gestural pointing when expressing joint attention could make the behavioral content of the gaze/gesture clearer and, thus, be used as an intervention technique in ASD (Taylor & Hoch 2008). Here, we used an eye-tracking device in order to obtain a measure of RJA in different gaze cueing intensity or gestural conditions. We hypothesize that exaggerated facial expression or gestural pointing helped children with ASD to respond to joint attention behaviors. We designed an eye-tracking task in which a woman attempts to direct attention to an object by looking at it. In this task the emotional expression of the woman was neutral, light or intense. In a supplementary condition, a gestural pointing supported gaze-cueing. We also collected behavioral measures of RJA using the Early Social Communication Scale (ESCS, Mundy et al., 2003). Twenty-five children with ASD and 21 typically developing (TD) children between 1.5 and 4.5 years of age participated to this study. We found that, as a group, children with ASD orient less to face in our RJA eye-tracking task ($U=106$, $p< 0.001$) and they answered less frequently to RJA ($U=74$, $p< 0.0001$) compared to their TD peers. Children with ASD showed different patterns of RJA among conditions ($Fr=31.40$, $p< 0.001$) with better responses in the intense and in the pointing conditions. Finally, measures for RJA at the eye-

tracking task were positively correlated with behavioural measure for RJA at the ESCS (rs=0.62, *p*=0.009). Our results support the view that facilitating the early development of RJA skills, as it might be the case of content clarification through exaggerated emotional expressions or gestural pointing, should be integrated in each early intervention therapy. Also, eye-tracking measures of RJA represent a valid and interesting tool to quantify RJA in young children with ASD.

Keywords: Autism Spectrum Disorders - Joint Attention - Eye Tracking

18. The role of alexithymia in emotional reactivity and regulation in children with autism spectrum disorder

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Emotional disturbances, including emotional reactivity and regulation difficulties, are common among children with autism spectrum disorder (ASD) and pose risk factors to other problematic behaviors. In addition, alexithymia has a high prevalence among individuals with ASD and has been considered to be more relevant in the development of emotional problems than ASD symptoms themselves. The present study aimed to examine the effect of alexithymia on emotional reactivity and regulation difficulties in children with ASD compared to typically developing (TD) children. Thirty-seven children with ASD (low- and high-functioning) and 41 TD children (age range: 3 – 13 years) and their parents participated in the study. A multi-method assessment including parent-reports, behavioral, and physiological measures of children's emotional reactivity and emotion regulation were used together with a parent-report of children's alexithymia. Compared to TD children, children with ASD had more difficulties in all indicators of emotional reactivity and regulation even after controlling for alexithymia. In addition, regression models indicated that alexithymia contributed significantly to the explanation of certain aspects of emotional reactivity, but did not contribute further to explain emotion regulation difficulties. In addition, age had a significant effect only on one physiological parameter of emotion regulation (i.e., RSA). These findings suggest that interventions targeting emotional reactivity would benefit from integrating alexithymia, and that interventions on emotion regulation could help alleviate emotional disturbances in ASD.

Keywords: Autism spectrum disorder - Emotional reactivity - Emotion regulation - Alexithymia

19. Motor efficiency - but not cerebral palsy - is related with intelligence in children with neonatal stroke

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In this study, we aimed to explore the relationship between motor skills and intelligence in children who suffered from Neonatal Arterial Ischemic Stroke (NAIS). Outcome of these children has been the subject of many studies either focused on cognitive impairment or on motor deficits, namely unilateral cerebral palsy (CP). In accordance with studies on children with CP, NAIS studies showed such correlations between intelligence and CP. Nevertheless, epilepsy as a cofactor was not controlled in these studies. Moreover, these clinical studies did not take into account findings from normal psychomotor development studies where this link was explored through motor efficiency. Indeed, motor skills cannot be reduced to the presence of an unilateral CP, a dichotomic variable. This raises the following question: What is the impact of unilateral CP and motor efficiency on cognitive development and how do they respectively contribute to it?

57 children without epilepsy, who sustained an NAIS were assessed by WISC-IV and by a combination of the box&block and the 9-hole-peg tests at age 7. In our model, intelligence was correlated with motor performance, regardless of the presence of CP. But, the counterpart was not demonstrated: CP alone did not predict intelligence.

This finding leads to two main conclusions. 1/CP is a clinical variable not directly associated with intelligence or cognitive development by itself. 2/Our results provide arguments to the fundamental assumption of Piaget theory that children build intelligence from motor action.

These results provide a new perspective based on an embodied cognition approach in which intelligence and motor outcome are pervasively intricate. Moreover, it supports the idea that unilateral CP could have co-substantial effects on 1/motor abilities of the valid hand, 2/motor planning, and 3/the whole brain development. All these interactions would shape cognitive development.

20. Trajectoire développementale des croyances métacognitives et des manifestations anxieuses chez les adloescents de 13 à 17 ans

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Les métacognitions, ou cognitions sur les cognitions, ont été définies de diverses manières et de nombreuses fois par différents auteurs depuis le début des années 60. De plus en plus, la recherche tente d'intégrer différentes perspectives et approches afin d'en donner une définition plus universelle. Cette étude présente les résultats de la validation française du questionnaire des métacognitions créé par Wells et collègues et très utilisé en recherche, comme en clinique. D'autre part, cette recherche trace les trajectoires développementales des croyances métacognitives chez les adolescents, sur une période de 3 ans, et met ces résultats en lien avec les manifestations anxieuses rapportées par les participants à chaque temps de mesure.

Méthode : Le MCQ-A et le RCMAS ont été soumis 3 fois en 3 ans à des adolescents de 13 à 17 ans. Outre la validation du MCQ-A en Français, l'étude met en lien ces deux questionnaires pour illutrer par deux analyses longitudinales l'évolution de ces dimensions et de leur lien sur une période de 3 ans.

Résultats: Les résultats de la validation rapportent de bonnes qualités psychométriques et de bons indices de fit pour notre échantillon de 260 adolescents francophones. L'analyse transversale initiale avait montré une augmentation du facteur des croyances métacognitives négatives avec l'âge et un lien positif avec l'anxiété. Les analyses longitudinales suggèrent des relations significatives entre croyances métacognitives et anxiété à l'adolescence, ainsi que des effets spécifiques en début et fin d'adolescence.

Conclusion : Les résultats de la validation du MCQ-A montrent que ce questionnaire est applicable à une population d'adolescents francophones. Cette 1ère étude longitudinale illustre des liens possiblement causaux entre les croyances métacognitives et les manifestations anxieuses. De plus, les résultats obtenus permettent de mettre en évidence des trajectoires développementales spécifiques entre le début et la fin de l'adolescence.

Keywords: Métacognition - Adolescence - Anxiété - Trajectoire développementale - Validation - Longitudinale

REASONING

21. Development of Disjunctive reasoning

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In the field of reasoning, a lot of research has been conducted on the development of the understanding of conditional statements (”if ... then”), but very few is known about the development of disjunctive reasoning (”it’s a cat or a dog”). Our research aims to fill this gap. We have presented a falsification task to children aged 6-7, 8-9 and 11-12. They had to judge whether each logical case (p q, p q, p q, p q) obeyed or not a disjunctive rule (e.g. ”the circle is red or the star is yellow”). We used three types of disjunctive rules: ”p or q”, ”p or q, or both”, and ”p or q, but not both”. According to the Mental Model Theory (Johnson-Laird and Byrne, 2002), individuals reason by constructing mental models. Each mental model represents a possibility and can be interpreted as a scheme the structure of which is similar to that of the situation represented. Developmental research on conditional reasoning showed an increase in the number of mental models constructed with age (Barrouillet, Grosset & Lecas, 2000; Gauffroy & Barrouillet, 2014; Markovits & Barrouillet, 2002). Accordingly, we expected that children of 6-7 years would build only one mental model and give a conjunctive interpretation of disjunctive rules (i.e., ”or” is understood as ”and”). Then, 8-9 years old children would build two mental models and give an exclusive interpretation, (”red circle” or ”yellow star” but not both). Finally, at 11-12 years, children would build three mental models and give an inclusive interpretation (”red circle” or ”yellow star” or both). Our results confirmed these predictions.

Keywords: Disjunctive reasoning - Children

22. The influence of task on the development of conditional reasoning

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This study focuses on the development of interpretation of conditional statements of the form "if p then q" (e.g., "if the square is blue, then the circle is yellow"). The mental models theory (Johnson-Laird & Byrne, 2002) suggests that conditional reasoning is based on the construction of the mental models of the states of affairs that the sentence describes. In a first step, we construct an initial model p q (blue square and yellow circle). This representation can be completed by fleshing-out process, which allows the construction of two additional models ¬p ¬q and ¬p q (respectively red square and green circle; red square and yellow circle). Several studies (Barrouillet, Grosset,& Lecas, 2000; Markovits & Barrouillet, 2002; Gauffroy & Barrouillet, 2014) have shown that conditional reasoning evolves from a conjunctive interpretation (construction of the single p q model) in young children, then biconditional interpretation (two models, p q and ¬p ¬q) in teenagers and conditional interpretation (three models, p q, ¬p ¬q and ¬p q) in adults. In line with Gauffroy & Barrouillet (2011), we predicted that this developmental trend could be modulating by the task. More precisely, a task more ecological than traditional tasks could facilitate the interpretation of conditional, inducing a lag in the developmental trend. In other words, we expect an earlier interpretation of the conditional in ecological task. The results corroborated our expectations.

Keywords: Conditional reasoning - Task influence

23. Structural learning: a promising concept to grasp individual differences that are relevant for real-life outcomes

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This study asks how the ability to learn shared structure across tasks-structural learning (SL) may be related to demographic (age, sex), but also cognitive (D2, SART, Lachaux attention tasks), academic (grades, Conners) and lifestyle (media usage, sleep) factors. To assess structural learning, 8 to 12 year old children [N = 95] played ”Catch-the-Wolf ”, a new visuospatial game in which they are asked to infer the trajectory followed by a wolf in order to catch it. This game has four levels of increasing difficulty which children play in the same order. A key aspect of this study is that the behavior of the wolf in each of the four levels is governed by a common generative model. And learning the wolf ’s behavior on level L+1 is facilitated for participants best able to infer the generative model from all preceding levels (1 to L).

Structural learning performance-expressed as the Kullback Leibler divergence of participant’s model relative to an ideal learner-suggests the existence of two groups of subjects, good and poor learners. Furthermore, SL, as well as all cognitive abilities improved with age. A PCA summarized individual differences into five components which were then used as predictors for SL. Two dimensions of the PCA, one loading on academic performance, the other on video game use, best separated good from poor learners. Surprisingly, although attention (as measured here) and SL both improved with age, they appear to be rather independent. This study presents a new, short (20min) entirely computer-administered SL task. Performance on this task was found to mature with age and to capture variance related to academic performance, suggesting it may be an interesting tool to efficiently assess academic capacity. While high videogame users performed better, it remains unclear whether this documents a positive effect of gaming, or results from our task being videogame-like.

Keywords: Statistical - Structural - Learning sustained - Attention - Academic - Videogame

24. The development of operations and of the notation of heard music: a study with adults based on Piaget's theory

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The action to notate heard music is usually practiced during the Music learning process, and the students are expected to write what they listen without any exterior help (like a musical instrument). Students and teachers/professors consider this competence (to notate heard music) one of the most difficult to be developed by a musician. Otherwise, almost nothing is known about how that development happens, and we believe that this knowledge could enable the construction of proposals to overcome the difficulties of teaching and learning that competence. The action to notate music depends on the realization of operations, that is, actions that occur inside the mind of the subject and enables him to comprehend the signification of the sounds heard in terms of pitches, rhythm and so forth. The objective of this study was to investigate the development of the notation of heard music, conceived as something that depends on the development of musical operations. A study was conducted, according to the Piagetian clinical method, with nine participants, all of them adults, distributed in professional musicians, college and beginners music students. During the study, the participants were asked to produce the notation of an excerpt of a Bach's composition and to answer an interview. It was possible to observe that the development of the operations related to the competence to notate heard music is very similar to the line of development observed by Piaget during his studies with children and adolescents. That is, the development begins with no manifestation of the construction of operations and almost no adequate notation, followed by partially correct notations, possible thanks to the development of concrete operations. The last moments of development involve the manifestation of formal operations, which enables the subject to construct and test hypothesis of musical notation without any material or exterior help.

Keywords: Musical development - Development of musical operations - Notation of heard music - Musical dictation - Ear training

WORKING MEMORY

25. Working Memory in Children with Agenesis of the Corps Callosum: An fMRI study

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Working memory (WM) is the system responsible for maintenance and online processing of information. In typically developing (TD) children, WM is underpinned by a frontoparietal network of interacting left and right brain regions. The corpus callosum connecting the two hemispheres is crucial for transfer and integration of information across the brain. Developmental absence (agenesis) of the corpus callosum (AgCC) is a congenital brain malformation resulting from disruption of corpus callosum formation. This study aims to investigate functional organization of WM functions in children with AgCC using functional magnetic resonance imaging (fMRI).

Nine subjects with AgCC and 16 typically developing (TD) participants aged 8 to 17 years were recruited from the Royal Children's Hospital, Melbourne and completed an fMRI WM paradigm (3T MAGNETOM Trio scanner, standard 12-channel coil). This WM paradigm allows investigation of activations during encoding and recognition periods. fMRI data were preprocessed and analysed using SPM8, and a customised template was created using the DARTEL toolbox.

There was no difference in accuracy for WM retrieval between the AgCC and the TD group. Similarities in brain activation patterns were found during encoding (occipital and frontal activations) and retrieval (fronto-parietal activations) for the two groups. For encoding, small differences in cluster localization were found in occipital areas. For recognition, increased frontal activation was found in the AgCC compared with the TD group. Increased brain activity in TD children were observed in right prefrontal ventrolateral regions and left supra- marginal regions in TD; whereas children with AgCC recruited the left posterior cingulate cortex.

In summary, although children with AgCC present with atypically developing brains, globally similar regions in the TD brain appear to be recruited during a WM task.

Group differences in brain activity could presumably reflect different hemispheric lateralization, as well as different cognitive strategies to encode and retrieve information.

Keywords: Children - Working memory - Agenesis of the Corps Callum, fMRI

26. Associative relatedness enhances gist-based false memories in working memory

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The effects of associative (or semantic) relatedness between items have been widely studied in long-term memory. There is strong evidence that lists of associatively related items both facilitate memory and produce false memories. Gist-based processing has been proposed to account for these effects. Recent research showed that false memories could also occur at short term (e.g., Atkins & Reuter-Lorenz, 2008). The aim of the present study was to examine the contribution of gist to false memory at short delays. Participants encoded either lists of four associatively related or unrelated words. Participants were then probed following a 4 seconds filled retention interval. Results indicated that associatively related lists increased the rate of false recognition of related lure words. Associative relatedness between words also enhanced gist memories while verbatim memories were unaffected. These findings suggest that gist memory could also underlie false recognition in working memory.

Keywords: Workinf memory - Gist memory - False memories

27. Proposal of working memory training program for complex syntax facilitation

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Specific language impairment (SLI) and autistic spectrum disorder (ASD) participants display (1) deficits with complex syntactic structures, (2) working memory (WM) limitations, and (3) links between syntactic deficits and WM capacities (Gathercole & Daddeley, 1990; Delage, 2015; Durrleman & Delage, in press). According to these results, it becomes conceivable that in both clinical groups difficulties in WM may limit their language capacities. Thus, we hypothesize that the training of WM capacities will prove itself beneficial for syntactic capacities, particularly for the most complex constructions involving embedding and/or syntactic movement, as these are most likely to solicit computational resources (Jakubowicz, 2011; Delage & Frauenfelder, in prep.). This training will be evaluated with typically-developing children, and then with children with SLI and ASD, for whom there is a potential clinical application. The aim of this research proposal is to create an original WM training program which focuses on the previously identified weaknesses in SLI and ASD.

To date, WM performance in SLI participants is characterized by deficits on simple and complex verbal spans. Studies showing clear links between WM and syntax support the influence of WM on syntactic capacities. Indeed, the counting span (complex WM task) in TD children (Delage & Frauenfelder, in prep.) and the (verbal) serial memory (simple WM task) in SLI children (ibid.,2013) are of special interest. For ASD, the rare results indicating a relationship between WM and syntax have implied both simple and complex span tasks (Durrleman & Delage, in press; Schuh & Eigsti, 2012).

This poster aims to present an overview of the project with a presentation of the training program which includes five WM tasks. Moreover these tasks capitalize on the finding that children with learning disabilities particularly enjoy new technology activities (Huttinnger, 1996), and thus the tasks will occur in the form of I-Pad applications.

Keywords: Complex syntax - Working memory - Special language disorder - Autistic spectrum disorder - Training program

28. Working memory: what changes in development

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Several models assume that working memory (WM) development depends on age-related increase in efficiency and speed of processing. According to the Time-Based-Resource- Sharing model (TBRS, Barrouillet & Camos., 2015), the development of mechanisms that prevent forgetting of memory traces may also be important. In 2011, Gaillard and al. tested this hypothesis in three experiments in which two groups of children aged 8 and 11 performed a complex span task in which they had to maintain series of letters while adding numbers to series of digits. As expected, the first experiment revealed a developmental difference in WM spans between groups. In the second experiment, processing and restoration times were equated between groups, which resulted in a reduction of the developmental difference. In a third experiment, the time available to reactivate memory traces was tailored to the processing speed of each age group. This later manipulation abolished the developmental difference. The aim of the present experiment was to replicate and extend the results of Gaillard and al. (2011) by comparing groups of children aged 8 and 14. As in Gaillard and al. (2011), equating processing time and tailoring restoration times strongly reduced developmental differences, demonstrating that the age-related increase in the efficiency of restorative processes plays a major role in WM development.

Keywords: Working memory - Development

29. Working memory development: the effect of consolidation time

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Working memory is a limited capacity system. The TBRS model (Barrouillet et al., 2004) assumes that working memory representations suffer from temporal decay and interference. However, this forgetting can be counteracted by refreshing memory traces. This mechanism, which is called attentional refreshing, develops from the age of 7 and becomes more efficient with age (Barrouillet & Camos, 2009). Another process in working memory has been shown to play a crucial role in WM performance by strengthening memory traces that better resist interference and decay: consolidation. Consolidation in working memory is defined as the process by which ephemeral sensory traces are transformed into more stable short-term memory traces (Potter, 1993). From the few studies on consolidation that have been conducted until now, none has adopted a developmental perspective. The aim of this study was to determine whether the process of consolidation develops with age in the same way as the mechanism of attentional refreshing. We presented three age groups (8, 11 and 14 years) with a complex span task involving the maintenance of letters while reading digits as a distracting task. Consolidation time, that is the time elapsed between each letter and the first subsequent digit, was manipulated (0 ms, 1000 and 3000 ms) as well as the cognitive load involved by the reading digit task (digits presented for either 666 or 1333ms). Beyond the trivial effect of age, the results showed an effect of consolidation time which is more pronounced in older children, suggesting that the consolidation process is available and efficient at least from age 8 onwards and develops with age.

Keywords: Working memory - Development - Consolidation

30. Goal maintenance and working memory in preschoolers. Can goal cueing improve their performance and under what conditions?

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Goal neglect has been shown to contribute to preschoolers' poor executive control. Is it also involved in their poor working memory capacity? To address this question, we tested two forms of goal cueing with visual animations. During the retention delay of a Brown-Peterson task, one hundred 3 and 4-year-old children had to maintain verbal information. In two experiments, an informative animation was used as goal cueing and a non-informative neutral animation was used as baseline. Moreover, the degree of concurrent attentional demand to process the informative cue was varied across experiments. In a first experiment, children had to track the visual goal cue along its path, thereby performing a motor control task. In the second experiment, there was no motor control requirement associated to the visual goal cue. The findings evidenced the role of both motor control and goal maintenance in this age range. Their differential impact as a function of age will be discussed. A final control experiment assessed the impact of the same motor control task but without goal cueing. This study is a first attempt to examine the impact of goal cueing in the development of working memory in preschoolers. Future studies will specify the characteristics of goal cue to support preschoolers' working memory performance.

Keywords: Working memory - Goal maintenance - Preschoolers - Cognitive development

31. Phonological effects on maintenance of verbal information in 6- to 8-year-old children

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Two mechanisms allow the maintenance of verbal information in working memory: articulatory rehearsal and attentional refreshing. Phonological effects, like the word length effect (WLE) and the phonological similarity effect (PSE), are known to affect the maintenance of verbal information in adults. However, these effects disappear under concurrent articulation. The aim of the present study was to assess the interplay between these mechanisms and to explore these phonological effects in 6- to 8-year-old children. In two complex span tasks, the opportunity for refreshing was manipulated by varying the attentional demand of the concurrent task. Simultaneously, the articulatory rehearsal was impeded by asking children to perform the concurrent task aloud. In the first experiment, children had to maintain lists of either similar or dissimilar words, whereas they had to maintain lists of either short or long words in the second experiment. Confirming our predictions, we replicated the effect of concurrent articulation and attention demand. PSE appeared only in 8-year-old children when attentional demand was low and without concurrent articulation. WLE appeared above 7 and did not interact with concurrent articulation or manipulation of attentional demand. To conclude, the efficiency of the two mechanisms improve from 6 to 9, with the phonological characteristics of the memoranda impeding working memory recall performance in different ways.

Keywords: Working memory - Maintenance mechanisms - Articulatory rehearsal - Attentional refreshing - Development

32. The role of attention in the maintenance of feature associations, a developmental perspective

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Within cognitive psychology, there is a debate about the role of attention in the creation and maintenance of feature associations within working memory (e.g., Luck & Vogel, 1997; Wheeler & Treisman, 2002). Initially, it was thought that attention plays a crucial role to create associations between features as well as to keep them together during retention (Baddeley, 2000). The most recent literature, however, indicates that attention is not a crucial factor for the creation and maintenance of the link between the features in working memory for adults (e.g., Baddeley, Allen, & Hitch, 2011; Vergauwe, Langerock, & Barrouillet, 2014). Instead, these findings suggest that feature associations are created rather automatically and their maintenance is achieved ”object”-based, as opposed to ”feature”-based, with the maintenance of features along with the associations between them (feature associations) not requiring more attention than the maintenance of features without their respective associations (single features). In the present study, we studied the role of attention in the maintenance of feature associations, adopting a developmental perspective. We examined whether this ”object”-based maintenance of feature associations, observed in adults, is something that develops with age, or whether feature associations are already from an early age maintained as unified objects. Therefore, we have measured the working memory maintenance capacities of children aged 8, 10 and 12 years, both for single features as well as for feature associations, under a low or a high attentional load. If the maintenance capacity for feature associations is more affected by the presence of a high attentional load than is the maintenance capacity for single features, then this would suggest a crucial role for attention in the maintenance of feature association. The results of the present study will be discussed regarding the developmental trajectory of the role of attention in the maintenance of feature associations.

Keywords: Cognitive psychology - Working memory - Attention

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