PHD OPEN DAY 2018

Doctoral course in Cognitive Science
7 June 2018

Palazzo Fedrigotti, corso Bettini 31 - Rovereto (Tn)

Registration until 1st of June
If you are interested in the research activities of the students of the PhD program in Cognitive Science of the University of Trento, or if you are thinking to apply for a PhD, the Open Day is an excellent opportunity to know more about the course program and the research opportunities within the PhD in Cognitive Sciences (former Psychological sciences and education) at the University of Trento, to meet current students and faculty members and to informally discuss your research interests with them.

Contents

The PhD Open Day includes: (1) Short talks and poster presentations by current PhD students, (2) Meetings with our current students and PIs of the research groups, (3) Opportunities to learn more about the lines of research within the PhD program, (4) Information about funding, entry requirements and career perspectives of the PhD.

Special events

A special event on How to succesfully apply to the Doctoral Course, in which prospective applicants can get directly in contact with potential supervisors, evaluate the fit between their research interests and the course opportunities, receive tips and advice on how to get through the application and selection process in order to make ones own application successful.

Attendance

The attendance is free of charge but we strongly suggest to register at the link: https://it.surveymonkey.com/r/PhD_Day_2018

Information

If you are interested in both PhD areas and courses please visit: http://web.unitn.it/drspf. For the PhD Application you can see: http://www.unitn.it/ateneo/57173/concorso-di-ammissione For further information On the Open Phd Day please contact us at: phd.dipsco@unitn.it
## Program Overview

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### Talk Session
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Shame on you! Neuropsychological evidence of shame processing

Edoardo Pappaianni

XXXII Cycle (Tutors: R. Job, A. Grecucci)

One of the unsolved issues in affective neuroscience is how the brain regulates the self to foster a moral life. Defined as a moral emotion [1], shame is believed to pursue this goal. Although the neural correlates and the psychological mechanisms of basic emotions have been largely investigated, the neural bases and mechanisms of shame are still a matter of debate.

The purpose of this talk is to investigate the neural correlates and psychological mechanisms of shame. First, I will present results from a meta-analysis of the existing functional neuroimaging studies on shame (and guilt, another moral emotion often mistakenly confused with shame).

From this meta-analysis emerges a functional network including mostly frontal regions. In order to test the reliability of this network, we developed a behavioral paradigm that would allow studying the shame more in-depth. I will present the preliminary results coming from a single-case study, a patient with bilateral damage to the amygdala, and patients with traumatic injury. Our ad-interim conclusions seem to indicate a possible role of the amygdala and a frontal network that may be related to shame perception and regulation.

keywords: emotions, shame, patients, single-case


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1This work has been done in collaboration with Scuola Internazionale di Studi Superiori Avanzati (SISSA, Trieste) and Centro Puzzle (Torino).
Socioemotional development in school-age children with high functioning autism spectrum disorder: understanding the contribution of attachment and adaptation

Michele Giannotti

XXXII Cycle (Tutor: S. de Falco)

The most recent investigation on School-age children with High Functioning ASD [1] confirms earlier metanalytic findings in infancy [2] of no differences in security of attachment rates in comparison to matched neurotypical children. However, others studies showed contradictory results on the security of attachment rates in ASD [3], suggesting a challenge in the formation of Internal Working Model which occurs in later development [4]. Nevertheless, little is known about the nature of attachment relationship and representations in children with ASD during middle childhood. Up to date, the study of attachment representations in ASD and their link with environmental factors and childs outcomes remains unexplored. Thus, to address this issue our study focused on the rates and implications of attachment organization in these clinical group. A secondary aim of this study is to determine what child and parent-related variables function as a risk or protective factor for the development of attachment in ASD.

Twenty school-age children (8-12 years-old) with High Functioning ASD (no intellectual disabilities) and their parents were involved in this study. The sample also included 20 matched typically developing children and their mothers and fathers. Measure of childrens attachment representations and socioemotional skills were collected using questionnaires, an observational procedure and a semi-structured interview. Parents also completed questionnaires on parenting stress and style, empathy and attachment.

Firstly, results will examine if the hypothesis of no difference in attachment security rates will be confirmed even including an assessment of attachment representations. Secondly, both child and parents correlates of attachment organization will be determined using a triadic perspective. Preliminary results on perceived childs emotional abilities and attachment security with parents and peers will be discussed.

A greater understanding of attachment representations and their contribution to child socioemotional development could suggest functional explanations around the meaning of protective behaviors emotion regulation, and HFASD symptoms. The study of the bidirectional effect between parenting and childs attachment in this group could have strong implications for the design of attachment-based intervention, promoting new strategies to improve quality of parenting and childs adaptation in ASD.

keywords: Autism, Attachment, Socioemotional development, School-age


1This work has been done in collaboration with Observation, Diagnosis and Education Lab (ODFLab), Department of Psychology and Cognitive Science (University of Trento).
Primary school teachers attitudes towards the visibility of special needs identities within the school textbook

Fabio Filosofi

XXXII Cycle (Tutor: P. Venuti)

Grounded in disability studies [1], the current study investigates the attitudes of teachers working in Italy in primary schools towards the textual and visual representation of special needs identities in materials. Former literature in this field has primarily focused on one aspect: textbook analysis aimed at verifying the visual and textbook representation of disability [2]. However, no study up to date has investigated teachers attitudes towards the visual or textual representation of special needs within the school textbook.

The study investigates the teachers attitudes towards the visibility of special needs identities in materials in use, the teachers response and difficulties to the introduction of special needs inclusive materials in their classrooms and finally the teachers reflections on the general representations within the school textbook. The study will take place over two phases following Creswells sequential-exploratory mixed method [3]. This approach is associated with transformative research as a way to favor teachers reflection on inclusion [4]. The first phase has now been completed: data have been collected from 16 informants through semi-structured interviews. In the second phase, themes emergent from interview-coding will be used to design a Likert scale questionnaire to be administered in schools across Italy. The first phase of the study found positive attitudes towards the idea of disability representation in textbooks. However, difficulties in managing a special needs inclusive pedagogy have emerged from the interviews. Indeed, informants have raised possible criticalities resulting from the introduction of inclusive materials. In particular, potential issues have been identified in the relationship between the teacher and other stakeholders, such as the learners families. Finally, informants have been found to conform to textbook representation as they are not encouraged to do otherwise by their political and social context.

It should be noted that the transformative aim of this research is key to the study. Evidently, respondents are expected to reflect on the representation of special needs through interviews and questionnaires. The teacher-respondents reflection should encourage greater awareness of the presence / absence of individuals with special needs in school materials and textbooks.

keywords: special needs, inclusion, school textbooks, teachers attitudes.

The limits of a computational explanation of rational thinking

Jodi Guazzini

XXXII Cycle (Tutor: S. Dellantonio)

The possibility of accounting for those aspects of mind which involve some phenomenal (what-is-like) feature starting from a computational model of mind has been widely criticized (for example Piccinini 2010). However, it appears that the computational model has at least the resources to explain rational thought (for example Churchland [1]). The aim of my research is to investigate whether this is the case.

Theory and engineering of computation, and information theory, are some of the most used means for drawing experimentally investigable hypotheses about mind in general, and reasoning in particular [2]. Behaviorists claims were rejected relying on the conceptual apparatus developed in these fields of research. Moreover, Computationalism is still the model for describing cognitive processes that is closest to the brain. Since the brain constitutes the actual existence of mind, we cannot avoid to refer to it. These are the reasons for which it is important to consider whether the idea of computation as well as the notion of representation conveyed by the computer science research are actually adequate to describe at least some aspects of human thought related with reasoning.

In my talk, I will go over various salient stages of the history of the cognitive research starting from Behaviorism. In particular, I will show how and why computational theory and engineering came to play a pivotal role in answering to the Behavioristic epistemological demands [2,6]. I also point out some features of the model of mental processes and representations provided by computationalism [3,4].

In the conclusions, I argue that those features of the symbolic representation used within the computational model of mind are counterproductive relatively to the purpose of cognitive science (explaining mind as a source of causally relevant conscious representations) when applied to human cognition.

Moreover, I also summarize the further steps of my work, which concern whether genuine rational knowledge (meant as theoretical understanding of the world and competence in demonstrating the objectiveness of this understanding) can take place in a computational device without conscious awareness of the relevant connections and concepts involved in the process of demonstrating.

keywords: Epistemology, computational modeling of mind, symbolic representation, phenomenology of demonstrative knowledge.

Both constrained and flexible: attentional templates of visual stimuli are shaped by linguistic structures

Giulia Calignano

***XXXII Cycle (Tutors: F. Vespignani, S. Sulpizio)***

How we built unitary percepts of events that join multiple sources of information? According to a mainstream theory, we create rather abstract unitary mental representation of events at the expense of modality-specific properties [1]. These mental representations guide our behavior and are referred to as attentional templates. The attentional template is a detailed and contingent mental representation that specifies a precise events dimension or feature, and influences the deployment of attention and information selection in a top-down fashion by facilitating the match of a new event to the prior attentional template [2]. In three studies, I investigate how linguistic structures can shape the nature of the attentional template of visual objects and thus can affect visuospatial attention.

In a first preregistered study 1, I investigate whether the information conveyed by single words boosts the attentional template and facilitates the disengagement of attention compared to tones and pictorial information, in 8-month-old infants. Measure of information processing and attention deployment are acquired by means of eye-tracker technique (i.e., saccadic latencies and pupil dilation).

In a second study, I aim to shed light on the flexibility of the internal (hierarchical) structure of such attentional template. In a visual search task, among simple objects (i.e., geometrical shapes and colors), I manipulate the cue by using a Noun-Phrase (NP, i.e., a red square) or a picture [3]. I expect that the NP and the pictorial cue can imply different internal hierarchies of the attentional template of an object [4]. Specifically, the more hierarchically important a feature is (because of linguistic reasons), or the more effective it is in guiding attention (because of perceptual reasons), the shorter will be the time needed to find the target in a subsequent trial.

Finally, in a third study I investigate2 with a Sentence Picture Verification paradigm by means of EEG measure (i.e., N2pc) how affirmative and negative descriptions of a target with two adjectives in different structural positions affects deployment of visuospatial attention. The main assumption here is that the adjectives that modify an NP are more salient in defining the target than the predicative adjective and, as a consequence they are expected to be more efficient in guiding visuospatial attention. Results are discussed in terms of how linguistic elements and structures can affect the way we deploy attention toward objects.

**keywords:** visuospatial attention, language, eye-tracker, EEG.


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1This study is in collaboration with Simone Sulpizio (UniSR, Milano) and Eloisa Valenza (Unipd, Padova).
2This study is in collaboration with Maximilian Paulus (UCL, London), Veronica Mazza (CIMeC, Rovereto) and Francesco Vespignani (DIPSCO,Rovereto).
The role of segments in pitch categorization, and of pitch categories in sentence-processing

Alessandra Zappoli

XXX Cycle (Tutor: F. Vespignani)

Pitch, perceptual correlate of Fundamental Frequency (F0) of sounds, is the acoustic sensation allowing to order sounds on a scale from low to high, independently from language. Language-specifically, pitch can be categorized in Pitch Accents (PAs) and Boundary Tones (BTs). Categories are linked to discourse structure and sentence interpretation.

In Italian, BTs can alone disambiguate statements (Low tone, L%) from questions (High tone, H%). In German, the falling PA (H+L*) is associated with Accessible Information (Acc-Inf), in Italian, with unmarked Broad Focus sentences. In German, Given Information (Giv-Inf) is commonly expressed through Deaccentuation (flat contour); in Italian, syntactic reorganization is preferred over Deaccentuation. Across languages, an equal sensory information links to different categories and discourse interpretation.

What is necessary in order to categorize a falling, or low, pitch contour (acoustic sensation) in a stable category: BT (L%) or PA (H+L*)? And what is necessary to link these categories to discourse interpretation (statement, or Acc-Inf)? Reversely, while interpreting discourse, is the acoustic sensation (low or high, rising or falling, F0) available to the perceptual system? In a first experiment (exp1), 37 participants had to linguistically categorize a contour shifting from L% to H%. BTs were aligned to 3 types of segments (existing-word, pseudoword, foreign-word), and to a vocal sound (no-segments); categorization was required in two orders: from highly recognizable to poorly recognizable/missing segmental information (seq 1), and reverse (seq 2). Data were fitted to a logistic curve, generating two parameters: slope and midpoint. Higher values of slope indicate a successful categorization process. Midpoint values are set by the perceptual categories boundaries. In seq 1, slope values do not vary; midpoint values vary in function of the recognizability of segmental information. In seq 2, slope and midpoint reflect a perceptual learning trend in function of recognizability of segments and access to meaning.

In a second experiment (exp2), German L1 and L2 speakers (L1=Italian), EEG was recorded while auditorily perceiving 3 PAs (1 congruent = H+L*, 2 incongruent) aligned to a target NP expressing Acc-Inf in pairs of German sentences. The congruent PA elicits a positive early peak at 200 ms (category match) in both language-groups. The N400 component (discourse integration) shows a 3-way-modulation in the L1 group (N=24) and binary modulation in the L2 group (N=25).

The less efficient linguistic-categorization and the less clear the pitch-discourse link, in absence of segments (exp1) and in L2 (exp2), highlights a strong interplay between pitch perception, segments-recognition and semantic access. The processing of multiple sources of information (F0, segments, lexicon, discourse) is likely to be expected and integrated in early stages of perception (0-400 ms). Coherent information at each level serves a more efficient processing of each of the others.

keywords: pitch, sound categorization, discourse update

1This work has been done in collaboration with Francesco Vespignani(University of Trento), Massimo Grassi (University of Padova), Cinzia Avesani (CNR-Padova); Petra Schumacher, Martine Grice and Stefan Baumann (University of Cologne).
Irony comprehension in high-functioning autistic children

Greta Mazzaggio

XXXI Cycle (Tutor: L. Surian)

Irony comprehension is a complex task that typically developing (TD) children reach around the age of six. Some scholars [1] claimed that 2nd order Theory of Mind (ToM) skills are required to understand irony, but also linguistic abilities play a role [2]. Conversational experiences as well might account for the asymmetry in the recognition of ironic criticisms, the most common form of irony, and ironic compliments [3]. Children with high-functioning autism (HFA) have intact linguistic abilities, but impaired social relations. Some children with HFA pass even 2nd order ToM tasks, even if they could be using compensatory verbalizing strategies [4].

We tested irony comprehension in HFA children with the aim to assess the contribution of the factors that may facilitate. We tested 26 HFA children (age 7;2) and 26 age-matched TD children. All participants were tested for non-verbal IQ, ToM and linguistic abilities. To assess irony comprehension we created a new task that consists of 10 short stories with a concluding remark that can be either literal or ironic (compliments and criticisms).

To analyze data on irony, we performed a mixed-effect logistic regression, with accuracy as dependent variable, and group (HFA vs TD), type of irony (compliments vs criticisms) and their interaction as fixed factors. Subjects and items were added as random factors. In both types of irony, accuracy was higher in TD children compared to HFA children (p = .001) and, in both groups accuracy was higher on criticisms than on compliments (p = .005). Pearson correlations revealed that in the HFA group only ToM abilities were significantly correlated with irony comprehension (p < .001), whereas in the TD group only linguistic abilities correlate (p = .03). HFA children showed a peculiar pattern: most children (16) exhibited an extremely low performance in ironic stories, whereas some (6) demonstrated a full comprehension of all ironic stories.

In order to account for these data, we can hypothesize that in general HFA children show impairment in pragmatic inference abilities and in ToM. Some children, on the other hand, might adopt a strategy, different from TD children, to respond correctly to ironic stories. It has been [5] found that HFA children applied a different processing strategy for irony comprehension, and hypothesized that they resort to a more rule-based strategy, with an intellectual-style approach to compensate their social deficits. Future research should investigate this hypothesis more in depth.

**keywords:** irony processing, pragmatics, Autism Spectrum Disorder, Theory of Mind


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1This work has been done in collaboration with Francesca Panzeri (University of Milano Bicocca) and Beatrice Giustolisi (University of Milano Bicocca).
Face perception at 12 months using the change detection paradigm

Gisella Decarli

XXXI Cycle (Tutors: L. Surian, M. Piazza)

Many studies have investigated the face perception not only in infants [1] but also in neonates [2], supporting the idea of an early preference for faces/facelike patterns at birth and the fast development of face detection and recognition in the first years of life. However, nobody has yet investigated the infants individual differences using the change detection paradigm and the relation between infants performances and their parents in separated analysis for mothers and fathers.

In this study we implemented the change detection [3], usually used to assess numerical discrimination. Infants observed two streams of images: one stream shows images that change in some features while the other shows the same image over time. We assessed 51 infants with two levels of change: one easy level (identity change), where we showed two different faces in the changing image stream, and one difficult level, where we change the configural features of the same images (we separated the distance between the eyes and between the eyes and the mouth). This level is found to be more difficult for children aged 6 years [4]. In parallel, we also assessed the parents performances with the Cambridge Face Memory Test [5]. In this test, parents memorized either one or 6 faces, and then were tested with 72 forced choice items, composed by three faces. They had to recognize which of the three images was the one they had previously memorized.

In infants we found a better discrimination of the easy level of change (identity change) compared to the difficult one (configural change) and a significant correlation between the two levels of difficulty in a within subjects design. We therefore concluded that the change detection paradigm can be applied in the assessment of face perception in infancy. Our data give further support to previous studies, confirming the idea that the configural change is more difficult to discriminate compared to the identity change. We also correlated the performances of infants and parents: there was a significant correlation between fathers and infants in the identity change.

**keywords:** face perception, change detection paradigm, infancy, development

Caregivers behaviors moderate infants calm state: objective evaluation of caregiver-infant interactions quality in a primate model

Anna Truzzi

XXXI Cycle (Tutor: G. Esposito)

Experiencing good parental behaviors during caregiver-infant interactions is mandatory for individuals adaptive development [1,2,3,4]. However, knowledge about how to quantitatively operationalize caregivers core behaviors and the quality of caregiver-infant interactions is still lacking. One important caregivers behavior is the carrying which elicits a calm state in the infant [5].

The present project aims to investigate how caregivers behavioral patterns differently moderate the carrying-elicited calm state in common marmosets (Callithrix Jacchus). In each session (N=261) a marmoset pup was put in a cage and one caregiver was allowed to reach the pup carrying it away. Behaviors and vocalizations were observed and coded (Cohens K=.87). Typically marmoset pups distress calls ceased at the rescuing. However, a few pups kept crying during carrying. This difference was dependent on caregivers identity. In response to more neglectful and rejective caregivers infants showed lower soothing levels. This was not an individuals predisposition since a same pup may behave very differently in response to its mother or father accordingly to caregivers own behavioral pattern. Findings reveal the possibility to evaluate caregiver-infant interactions style and quality starting from individuals key behaviors measured through early and objective assessment. If found also in humans, these key behaviors would open the door for earlier and finer assessments of parent-infant bonding.

keywords: social development, parental behaviors, infants soothing, caregiver-infant bond


1This work has been done in collaboration with Kazutaka Shinozuka, Saori Yano-Nashimoto, Sayaka Shindo, Atsuko Saito, Gianluca Esposito, Kumi O. Kuroda - RIKEN Brain Science Institute (Japan).
Decoding dyadic interaction in ASD with wearable sensors

Gabriele Calabró

XXXIII Cycle (Tutors: P. Venuti, C. Furlanello)

The recent diffusion of Wearable Devices (WD) allows the ecological acquisition of physiological data in contexts characterized by limited/subjective information. One of these contexts is the clinically relevant impairment of social interaction characterizing the Autism Spectrum Disorder (ASD). Physiological data could hence provide useful information to better understand what the person is experiencing [1]. At the same time, favoring the use of WDs instead of medical grade devices raises a significant problem: the quality of the acquired signal, which is potentially reduced by noise due to movements or technical faults.

This work proposes a robust signal processing pipeline to explore the analysis of Information Dynamics (ID) [2] on physiological signals as a framework to quantify the dyadic interaction. We apply the pipeline to study the interaction between a child with ASD and a therapist, acquiring the respective ECG signals via WDs during music-therapy sessions. The quality of the ECG signals is first evaluated with three Signal Quality Indices (SQIs): kurtosis, spectral power ratio and derivative energy. The SQIs are computed via windowing procedure and used to identify viable sessions and appropriate portions for the subsequent analysis. In light of the growing importance of ID in the analysis of interacting complex systems [3] applied in neuroscience [4], we selected the Mutual Information (MI) to quantify the amount of information shared in the ECG signals.

The SQI-based pipeline allowed to select 16 out of 42 sessions, highlighting the importance of the quality evaluation step to guarantee the reliability of the results. The pattern observed in the MI values shows a peak-like behavior which will be further investigated to find correlations with the quality of the dyadic interaction and provide feedback to the therapist. In order to to that, we plan to apply recent mathematical approaches such as deep learning.

keywords: autism spectrum disorder, dyadic interaction, information dynamics, ECG


1This work has been done in collaboration with A. Bizzego (Fondazione Bruno Kessler).
Hypothalamic activity and socioemotional behavior

Luciana Ciringione

XXXIII Cycle (Tutor: A. Caria)

In the recent years, many studies highlighted the role of the oxytocin (OT) and vasopressin, neuropeptides secreted by the paraventricular nucleus of the hypothalamus, in socioemotional behaviour [1]. In particular, it has been proposed that a severe dysfunction of the OT system [1] might underlie neural disorders that impair social cognition and behavior, such as Autism Spectrum Disorder (ASD). This hypothesis has been corroborated by several investigations demonstrating the positive effects of exogenous intranasal OT on socioemotional behaviour, such as face processing, theory of mind and emotion recognition in both healthy and clinical populations [2]. Despite the large number of studies that investigates the role of the OT on the regulation of human behaviour in social context, very few studies investigated the role of the hypothalamus in ASD.

An fMRI investigation reported atypical modulation of hypothalamic activity by social stimuli in ASD [3]. A neuroanatomical study based on voxel-based morphometry analysis revealed a reduction of grey matter size in the hypothalamus in ASD, although the total brain volume did not show significant differences between ASD and TD groups [4]. This latter study suggest a potential link between neuroanatomy and models of hormonal dysregulation in autism but robust evidences of structural and functional differences between ASD and TD are still lacking.

The aim of my study is to clarify the hypothesized dysfunctional role of the hypothalamus in ASD. To this aim, I will perform a functional MRI study using a novel socioemotional task investigating a possible differential hypothalamic activity between ASD and TD participants. Specifically, I will use a novel experimental paradigm based on classical conditioning using socially relevant stimuli paired with positive unconditioned stimuli. The proposed paradigm builds on previous studies showing elevated fear conditioning to socially relevant unconditioned stimuli in social anxiety [5].

keywords: fMRI, hypothalamus, socioemotional behavior, autism spectrum disorders

A nonparametric test for the race model inequality: a monte carlo simulation study

Marco D’Alessandro

XXXIII Cycle (Tutor: L. Lombardi)

The race model inequality (RMI) [1] is one of the most used testing procedure in empirical studies based on RT measures. In RMI the RT cumulative distribution function for the redundant signal target (RST) condition is never larger than the sum of the RT cumulative distributions of the single signal target (SST) condition, supporting the evidence for a separate-activation mechanism. In case a violation of the RMI is observed, this may be understood as an empirical support for a coactivation integration mechanism. For testing this inequality in single participants both parametric [2] and nonparametric [3] tests have been proposed in the literature. In particular, the proposed nonparametric testing procedure was based on a modified version of the ordinary Kolmogorov-Smirnov statistic which required that the number of trials in each SST conditions be determined randomly according to a mixture model representation. Unfortunately, this probabilistic assignment of the two SST conditions turned out to be affected by several practical limitations that compromised its application in most experimental work where the number of trials (for each experimental conditions) are usually fixed in advance by the experimenter.

In this contribution, we reformulate the testing framework in a new context which will highlight some neglected but relevant distributional properties of the stochastic terms involved in the race model inequality. Moreover, the proposed novel procedure will also be more consistent with the ordinary way to collect RT data in experimental works. In particular, a nonparametric procedure, based on a modified version of the Kolmogorov-Smirnov test for truncated data [4] was developed.

Two extended Monte Carlo simulation studies have been designed in order to evaluate the performance of the new testing procedure in controlling the type I error rate on the one hand, and the power of the statistics on the other. The two simulation studies consisted in complete multifactorial designs based on varying meaningful parameters in order to assess test performances for several distributional patterns of simulated, but realistic data.

Results showed that our nonparametric testing approach performed better compared to most orthodox statistical approaches [5] in testing the race model inequality.

keywords: Nonparametric, Monte Carlo Simulation, Race Model, Reaction Times Distribution


This work has been done in collaboration with H. Colonius (University of Oldenburg).
The reshaping of self-management: designing mHealth technologies and shaping new processes in type 1 diabetes care

Silvia Fornasini

XXXIII Cycle (Tutors: S. Gabrielli, E. M. Piras)

Type 1 diabetes (T1D) is an autoimmune disease characterised by deficient insulin production in the body that tends to develop in childhood. People with T1D need proper daily insulin treatment, regular blood glucose monitoring and healthy diets and lifestyles. In comparison with other chronic childhood diseases, the day-to-day management of this condition can be extremely challenging, especially as the diabetes regimen is difficult or impossible for a young child to carry out adequately without consistent support and assistance from the family [1, 2]. This model has been made possible by the increasing availability of patient-controlled technologies for diabetes self-management (e.g. glucometers, urine ketones testing kits) and for insulin self-dosage (e.g. syringes, pens and pumps). In this pathology, self-management is performed intensively: patients track a large amount of data, analyse them together with doctors and engage in a continuous learning process [3, 4]. The expertise developing around self-management technologies goes beyond the mere performance of computer-mediated work, and requires patients and practitioners to learn how to deploy practical knowledge and how to translate codified knowledge into knowing-in-practice. It is therefore necessary not only to study what the new technologies are (in terms of design) and how to introduce them appropriately, but also to ask what they do in relation to the enactment of knowledge in situated work practices [5]. Focusing on the management of type 1 diabetes, my research project will flank a clinical trial aimed at measuring the effectiveness and the acceptability of a self-care/remote-monitoring platform based on knowledge ontologies for type 1 diabetes patients.

First, the project will observe the design of a self-care supporting platform involving users and main stakeholders in the evaluation of the artefact, with particular attention to the patient profiling and motivation to change for a more personalized patient empowerment. Second, the project will focus on forms of appropriation and knowing of self-care practices and monitoring technologies (chatbot, dialog-based interaction) as a situated activity, observing how do humans and nonhumans associate in performing knowing-in-practice together. Third, the project will focus on the changes in organizational practices due to the introduction of the new technology in the hospital department, drawing on already existing care practices, organisational goals and departments educational programs for patients.

keywords: Type 1 diabetes, self-management, care practices

Conditioning of localized brain activity in auditory and visual cortex

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XXXIII Cycle (Tutor: A. Caria)

Classical conditioning is one of the most prominent discovery in the study of associative learning. One of the axiom of conditioning paradigm was the nature of unconditioned stimulus has to be biological salient for the organism in order to trigger a conditioned response. Brogden [1] observed the possibility to create associations between neutral stimuli, a paradigm known today as sensory preconditioning. Donald Hebb [2] provided a fundamental intuition about the process of associative learning, pinpointing the synaptic plasticity mechanisms as the key factor to explain. However, several aspects related to the mechanisms underlying the associative learning remain to be clarified. It remains, for example, to understand what kind of relationship between the conditional response and the unconditional response, in particular, in the specific case of the associative learning of non-salient sensory stimuli. Some fMRI studies have shown that after a learning period in which an auditory stimulus was coupled to one visual stimulus, the mere presentation of the auditory stimulus induced an activation of the occipital cortex [3]. More recently, Headley & Weinberger [4] observed an increase in evoked potentials in the rat by auditory stimuli in primary and primary visual cortices following the coupled presentation of auditory and visual neutrals stimuli through the sensory preconditioning paradigm. Furthermore, the study shows that the association learned between auditory and visual stimuli is attributable to spike-timing-dependent-plasticity mechanisms [5] in the primary sensory areas. To date there is no clear empirical evidence of such a mechanism also in humans regarding the associative learning of perceptual brain responses.

In this contribution, we proposes to find empirical evidence in favor of the hypothesis that the mechanism of classical conditioning may actually be a special case of a general brain mechanism, as Hebb's theory suggests, which allows to establish neural associations between stimuli of any type, regardless of their salience. The classical conditioning would therefore be due not so much to the fact that the unconditioned stimulus induces a peripheral automatic response but above all to the fact that any stimulus induces an implicit and unconditional neural response that underlies a specific behaviour. Associative learning would then be able to regulate both the action and the perception not based on the typical Pavlovian association stimulus behavioural response but rather to the association stimulus neural response.

keywords: classical conditioning, preconditioning, spike time dependent plasticity, associative learning

The dark side of the mood: structural markers of bipolar disorder

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Bipolar disorder (BD) is characterized by affective instability with an extreme fluctuation in mood and emotions, neurovegetative abnormalities, impulsivity, enhanced emotional reactivity and psychosis. Despite being a widespread mood disorder, it is often misdiagnosed and little is known about its specific neurophysiologic basis [1].

In recent years, there have been several studies that have tried to clarify the neural substrates and biomarkers of the disorder, capitalizing on the development of neuroimaging techniques (e.g. fMRI, MRI, PET) [2]. Specific functional and structural brain abnormalities underlying cognitive and emotional trait impairments have been proposed as biomarkers of BD, improving diagnosis and helping elucidate its pathophysiology [1, 2] In our investigation, we used a data-driven approach to structural data in order to better identify specific grey matter abnormalities in the brain of patients with bipolar disorder.

We selected T1 MRI images of 49 patients with bipolar disorder (mean age 35.28 (SD 9.02)) and 69 healthy participants as controls (mean age 35.44 (SD 8.73)) from a shared neuroimaging dataset from the UCLA Consortium for Neuropsychiatric Phenomics (CNP). In order to detect structural abnormalities underlying this disorder, we applied Source-based Morphometry (SBM), a multivariate approach based on the Independent Component Analysis that extracts maximally independent networks of voxels [3].

SBM returned twenty Independent Components (IC). Among these, two networks resulted statistically different between patients and controls. IC 10 (t(116) = -3.2642, p = 0.0014) is a fronto-temporal network included the middle frontal gyrus, precentral gyrus and inferior frontal gyrus. IC 19 (t(116) = -2.4157, p = 0.0173) is a more temporo-occipital network that involved the middle occipital gyrus, cuneus, middle temporal gyrus and caudate.

Two different circuits emerged, one including essentially frontal and temporal areas (regions related to emotion regulation), the other involving temporo-occipital regions (perception and visual-spatial coordination, previously found altered in bipolar patients [4]). In line with previous results, we emphasize the presence of structural abnormalities in bipolar disorder in top-down regulation and reward processing, strictly linked to their symptomatology.

keywords: bipolar disorder, structural imaging, psychiatry

(Morpho)syntactic complexity in clitics and clitic clusters: a view from typically developing and ASD children

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This project investigates the aspects of (morpho)syntactic difficulty involved in the performance of clitics and clitic clusters. Together with PRO, clitics are the pronouns that carry the least amount of information regarding their external referent, and their use is thus pragmatically sound when the latter is already part of the common ground between speaker and hearer. Among their characteristics are the obligatoriness of their adjacency to the verb of which they are the complements, and their designated and obligatory position in the clause with respect to the verb itself; the position in the clause depends on the mood of the verb (and the availability of the positions in the language) and can be either on the left or on the right of the flexed verb [1]. Some languages also allow more than one complement to be realised as a clitic, thus giving life to clitic clusters. Clusters display order restrictions that are not found in full NPs, and they can be of several types, which differ both syntactically and morphologically.

Typical acquisition of clitics reaches adult-like performance already at 4-5 years of age [2], while no relevant data on clusters is available in the literature. In atypical development, clitics have been found to be a notable area of difficulty in some atypical populations with an impairment in syntactic abilities, for instance in SLI, for which they are used as clinical markers [3].

In a first part of the study, we investigate the elaboration of aspects involved in clitics in both typical development and in an atypical population, namely ASD. Recent literature has in fact revealed that at least part of the ASD population displays some difficulties not only in pragmatics, but also with some syntactic structures. The fact that it is still unclear where the difficulties lie, what they stem from, and if and to what extent the individuals that show them have a common cognitive profile reveals the need to continue research in this direction. Among referential expressions, full pronouns have been the subject of some research in ASD [4], but the variety of syntactic phenomena involved in the realisation of clitics opens up greater opportunities of analysis of syntax in this population [5]. We hope to contribute to the discussion by individually investigating the syntactic aspects involved in the interpretation of clitics, and most importantly following a pattern of incremental complexity.

If results from typical development give us reasons to pursue it, a second part of the study will be devoted to a more in-depth analysis of clitic clusters, the acquisition of their patterns and restrictions in typical development, which is still uncharted territory in the literature.

keywords: clitic pronouns, syntax, language acquisition, autism

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