This research catalogue of the Department of Psychology, University of Copenhagen represents *examples* of the research areas and projects that may be used as *inspiration* for applications for PhD scholarships at the Department of Psychology offered by the Faculty of Social Sciences at the University of Copenhagen.

The examples are a representative sample of some of the research being conducted at the Department of Psychology, but do not cover all research areas. The applicants are thus urged to visit the department’s web site at [http://www.psy.ku.dk](http://www.psy.ku.dk) or [http://www.psychology.ku.dk](http://www.psychology.ku.dk) to inform themselves about the current research at the department.

Finally, it should be emphasized that applications with research topics not covered by the examples in the research catalogue are also welcome and will be evaluated on equal terms with applications directly inspired by the examples in the catalogue.

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PHD PROJECT AT THE CENTER FOR VISUAL COGNITION

Center for Visual Cognition is located at the Department of Psychology of the University of Copenhagen (see [http://www.psy.ku.dk/Forskning/CVC/](http://www.psy.ku.dk/Forskning/CVC/)). The Center was founded in 1993 and is currently a unit (Center for Integrated Visual Attention Research) under the Center of Excellence Programme of the University of Copenhagen and currently hosts three Sapere Aude research projects from the Danish Council of Independent Research (see [http://en.fi.dk/councils-commissions/the-danish-council-for-independent-research/sapere-aude](http://en.fi.dk/councils-commissions/the-danish-council-for-independent-research/sapere-aude)). The research at the center consists in experimental and theoretical studies in visual cognition. The experimental research is focused on visual attention, object recognition, mental images, perception of apparent movement, and visually guided intentional actions. The theoretical work is mainly focused around a computational theory of selective attention in vision (a Theory of Visual Attention, TVA, see Bundesen, 1990; and a Neural Theory of Visual Attention, NTVA, see Bundesen & Habekost, 2008; Bundesen, Habekost, & Kyllingsbæk, 2005).

PROJECT EXAMPLE 1:

NETWORK MODEL OF VSTM

Most theories of Visual short-term memory (VSTM) assume that the capacity limit is around 3 to 4 items with little variation for a given person (e.g. Luck & Vogel, 1997). However, in most experiments the distribution of reported items will be broader than this, e.g. ranging from 2 to 5 items, which speaks against a fixed limit of VSTM capacity. With the development of NTVA (Bundesen et al., 2005), VSTM is no longer understood as a static store holding information from a fixed number of visual objects. Instead, VSTM capacity is conceived as a dynamic equilibrium of a neural network behaving in a winners take all manner (see also Usher and Cohen, 1999). The basic model comprises a set of units representing each object in the visual scene. The units are connected with excitatory connections from sensory units outside the VSTM representing the given object, self-excitatory connections, and inhibitory connections to the other units in VSTM. Thus when a unit is activated by sensory input from units representing the object outside VSTM, the unit will sustain its activation by self-excitation and at the same time inhibit activation in all remaining units of VSTM. Usher and Cohen (1999) have shown that this type of architecture will yield an emerging representation of a maximum of about four active units given the right weight setting of the excitatory and inhibitory connections. In this project the NTVA model of VSTM will be further developed by testing it against results from behavioral experiments measuring the capacity of VSTM in whole report and change detection paradigms (e.g. Luck & Vogel, 1997; Kyllingsbæk & Bundesen, 2009). From the distribution of VSTM capacity derived from the whole report experiments different versions of our model of VSTM will be fitted. The processing rates of the items encoded into VSTM will also be manipulated to try to predict the effect on VSTM capacity by the model. In parallel to this, data from both whole report and
change detection run in the same subjects will be modeled using Bayesian model selection to investigate alternatives to traditional models of VSTM capacity.

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REFERENCES


PROJECT EXAMPLE:

IMPROVED MEASUREMENT OF RESPONSE TIMES

Response time is one of the most important variables in Psychology. In Cognitive Psychology and Neuroscience, response times inform us about the duration and organization of mental processes. In ergonomics, educational studies and in neuropsychological assessment, researchers are interested in the time that is needed to solve a problem or an assignment.

In many of these research areas, it is very common to “clean” the data before determining response time performance (e.g., Ratcliff, 1993). For example, outliers (i.e., unusually fast or slow responses) are eliminated from the data, as well as incorrect and omitted responses. It is assumed that the cleaned data better reflect the duration of the mental processes when the participant concentrates on the task. Instead of asking: “How long did it take to find the correct response?”, studies ask “How long did it take if the correct response has actually been found?”

In the proposed project this widespread practice will be challenged. The basic argument is that omitting any “problematic” behavior from a data set yields a biased and incomplete picture of performance. Alternative ways for estimating response times will be investigated (e.g., Koch et al., 2013), and their reliability and validity will be compared to classical methods. We will investigate and illustrate the use of the method in different areas of Psychology, for example, Experimental Psychology, Neuropsychological Assessment, research in Ergonomics and Educational Testing.

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REFERENCES


The Unit for Cognitive Neuroscience (UCN) is a basic research unit at the Department of Psychology of the University of Copenhagen (see http://ucn.psy.ku.dk). UCN was founded in 1980 (at the Medical Faculty of the University of Copenhagen) and became part of the Department of Psychology in the second half of the 1990ies. UCN is one of the core units within the international (but primarily Danish) interdisciplinary research centre ReCBIR (Research Centre for Brain Injury Rehabilitation – see http://recbir.psy.ku.dk). UCN is also part of the University of Copenhagen Programme of Excellence GluTarget (a programme primarily based on the former FARMA Faculty of the University of Copenhagen). UCN is specialized in animal model based studies of the functional organization and plasticity of the normal, injured and pathologically affected brain (e.g. Mogensen, 2011b; Mogensen & Malá, 2009). Research projects include animal model based studies within the clinical fields of neurology and psychiatry – with special emphasis on basic research on brain injury, functional recovery and posttraumatic rehabilitation upon brain injury. Theoretically, a major focus of the research of UCN is on models of the functional plasticity, organization and reorganization of the brain. Such theoretical research has often as the point of departure had the challenge of simultaneously accounting for the regional functional specialization of the brain (“functional localization”) and the posttraumatic ability of the focally injured brain to apparently reacquire the lost function (“functional recovery”). This apparent contradiction has been resolved by the creation of the REF-model (the Reorganization of Elementary Functions model) (e.g. Mogensen, 2011a, 2011c, 2012a, 2012b; Mogensen & Malá, 2009). The REF-model has been further developed in order to account for the organizational and reorganizational processes mediating problem solving and the dynamic development of mental and behavioural processes in the uninjured brain (e.g. Mogensen, 2011a, 2011c, 2012a, 2012b).

PROJECT EXAMPLE 1:

THE SUBSTRATE OF COGNITIVE FUNCTIONAL RECOVERY AFTER BRAIN INJURY WITHIN THE HIPPOCAMPUS AND/OR THE PREFRONTAL CORTEX.

To understand the dynamic interplay between the specialized modules of the brain – and thereby also develop comprehensive models of the neural processes mediating posttraumatic functional recovery after brain injury – it is essential to conduct animal model based studies (e.g. Mogensen, 2011b) scrutinizing the neural and functional reorganizations after focal injury to various parts of the brain (for reviews see Mogensen, 2011a, 2011c, 2012a, 2012b; Mogensen & Malá, 2009). At UCN, such studies have included mapping of the neural substrate of posttraumatic recovery after focal injuries to the hippocampus and/or the prefrontal cortex. This has, for instance, been done in studies addressing allocentric place learning of the mapping type (Mogensen et al., 2004a), egocentric spatial orientation
(Mogensen et al., 2005), spatial delayed alternation (Mogensen et al., 2007) and task requiring intra- and extradimensional shifts of responses/cognitive strategies (in preparation). These and other studies have demonstrated that the neural substrate of functional recovery after a particular type of brain injury varies significantly according to which cognitive domain and task is addressed (as is also indicated by the REF-model (e.g. Mogensen, 2011a, 2011c; Mogensen & Malá, 2009)). It is clear that the hippocampus and the prefrontal cortex in many instances contribute mutually to the posttraumatic recovery after focal injury to the individual structure (e.g. Mogensen et al., 2004a, 2005, 2007). Additional structures have, however, also been implicated – including parts of the parietal association cortex (Mogensen et al., 2004a) and regions within the basal ganglia – including parts of the neostriatum as well as nucleus accumbens. The project will continue the above-mentioned research lines and address – within a number of cognitive dimensions – the roles of not the least subregions of the neostriatum (e.g. Divac & Mogensen, 1985) and the parietal association cortex in the mediation of functional recovery after focal injury within the hippocampus and/or the prefrontal cortex.

PROJECT EXAMPLE 2:

SUPPORT OF POSTTRAUMATIC COGNITIVE REHABILITATION: THE ROLES OF ENVIRONMENTAL ENRICHMENT, PHYSICAL EXERCISE AND PHARMACOLOGICAL INTERVENTIONS.

While the cognitive training performed during a posttraumatic cognitive rehabilitative process is obviously of crucial importance, it is possible to support the outcome of such rehabilitative training via a number of additional therapeutic measures. Such measures include (but are not limited to) “environmental enrichment” during the posttraumatic period, types of physical exercise and activation during various intervals posttraumatically, and pharmacological treatment utilizing a spectrum of drugs. The project continues a number of previous and ongoing research lines at UCN. Regarding environmental enrichment, the focus will be on the relative importance of social and physical factors in the “enriched environment”, regarding physical exercise and activation the project will include voluntary (and presumably non-stressful) exercise as well as stress-associated types of exercise (e.g. Malá et al., 2008), and regarding pharmacotherapy, the project will include the use of erythropoietin (EPO) (e.g. Malá et al., 2005, 2007; Mogensen et al., 2004b, 2008a, 2008b) as well as glutamatergic drugs (e.g. Malá et al., 2012). The focus of the present project will primarily be on (1) the optimal timing of such interventions relative to the time of injury and the time of cognitive rehabilitative training (for instance, both of these timings appear to be of importance relative to the consequences of EPO – e.g. Malá et al., 2005, 2007) and (2) the potential synergistic (or other interaction-based) effects in case of the parallel use of two or three of these types of intervention. While these rehabilitative supportive methods differ in many respects, there are reasons to expect at least a partly common substrate of therapeutic action. For instance, both EPO (Mahmood et al., 2007) and physical exercise (e.g. Griesbach et al., 2004a, 2004b, 2009; Huang et al., 2006; Moltini et al., 2004; Vaynman
et al., 2003) may exert at least part of their therapeutic impact via an increased transcription and production of the neurotrophine BDNF (Brain Derived Neurotrophic Factor). Such common pathways of therapeutic action increase the likelihood of interactions – and potentially synergistic effects – between the mentioned rehabilitation-promoting interventions. Up to now, however, there has been only very limited research addressing such interactions.

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**REFERENCES**


subjected to transection of the fimbria-fornix and/or ablation of the prefrontal cortex. *Brain Research Bulletin, 73*: 86-95.


BRATLab (Brain Research and Advanced Technology Laboratory) has been established as a research unit at the Department of Psychology to conduct basic and applied research in the field of neurotraining through the use of advanced technologies such as artificial intelligence and virtual reality. Research at BRATLab ranges from basic to applied – primarily within the field of rehabilitation of brain injury. The experimental research targets the following themes:

- Generalization of effect – how it can be achieved through variation of training
- Intensity – how little do you need to train to get an effect?
- How to measure progress and effect of training
- Controlling progress of training through biological measurements (EEG, Heart Rate Variability, Galvanic Skin Response, etc.)

**PROJECT EXAMPLE:**

**COGNITIVE SKILLS LEARNING AND RELEARNING MECHANISMS IN HEALTHY AND INJURED BRAINS**

The brain relies extensively on implicit learning mechanisms in daily adjustment to changes in the environment. These mechanisms may be harnessed and controlled through intensive and targeted training [1-3]. However, there is very little data that combines the neuropsychological knowledge of the construction of skills with models of learning and relearning.

Understanding the difference in the ways normal and injured brains respond to highly controlled dosages of stimuli/feedback combinations could be an important key to understanding the experience-based recovery mechanisms of the brain [4-6]. A key question in that respect is whether the plastic processes of the brain can be harnessed through controlled exposure to stimuli for the maintenance, improvement and even repair of cognitive skills.

Ordinary models of skills learning may apply to some extent to the training of cognitive skills in healthy individuals. However, it is a different matter to determine the format and delivery of training aimed at restoring an impaired or destroyed cognitive skill. The REF-model (Reorganization of Elementary Functions) developed by Prof. Jesper Mogensen suggests a way to describe how recovery of function can take place despite neural destruction [7-11].
The research from BRATLab will contribute with knowledge about how training may assist in the recovery.

The Ph.D. candidate will be expected to target subjects within any of the themes mentioned above.

The candidate will be working in close collaboration with postdoc Inge Wilms.

CONTACT

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REFERENCES


PH.D. PROJECT AT BABYLAB, EARLY CHILD DEVELOPMENT UNIT

Essential experiences in the developing child happen in the interactions between the infant, the physical world and the significant adults in their lives. Early Child Development Unit (ECDU) is an overarching frame for research groups (e.g. UCPH Babylab, WARM) aiming to contribute to the science of early child development, early intervention and promotion of infant mental health and parenting. Our research is conducted within a Developmental Psychopathology framework and includes both basic and applied research in at-risk and typical early cognitive and social emotional developmental processes.

PROJECT EXAMPLE AT UCPH BABYLAB:

MINDING THE BABY’S MIND: PARENTAL REFLECTIVE FUNCTIONING AND SENSITIVITY IN DANISH FATHERS AND MOTHERS

It is well known that sensitive parenting (when the parent is responsive to the infant’s emotional signals and adequately meets the infant’s needs), is the most reliable predictor of parent-child attachment security[1]. Attachment is the affective bond that is established between parent and child in the first year of life. Securely attached children have learned through repeated interactions with a sensitive caregiver, that they can rely on the caregivers’ availability when needed, providing them with an effective strategy to cope with stressful situations, which is crucial for subsequent socioemotional wellbeing[2-4]. Reflective functioning (RF) is defined as the capacity to envision mental states in self and others and to understand their association with behavior[5]. Parental reflective functioning (PRF) refers to the parent’s ability to see the infant as a psychological agent, and it is recognized that early caregiving holds unique demands for parents’ RF due to the infant’s non-verbal communication and the parent’s involvement in regulating the infant’s distress[6]. The Parental Reflective Functioning Questionnaire[7] is a relatively new developed questionnaire to measure PRF. Within an ongoing community research partnership between UCPH BabyLab and The City of Copenhagen: “Copenhagen Infant Mental Health Project” (CIMHP), we aim to conduct a PhD project that will examine:

1. The validity of PRFQ in a Danish heterogeneous at-risk sample of mothers and fathers
2. The association of sensitivity measured with PRFQ and behavioral parental sensitivity during parent-infant interaction
3. The association between PRFQ and parental sensitivity and whether this is moderated by adult attachment dimensions and parental distress.

CIMHP is an ongoing project in which two instruments for detecting early risk indicators in primary care are validated and the effect of an attachment-based intervention for at-risk
families is tested in a randomized controlled trial. The sample for the planned PhD project will include 250 families (fathers $n=250$, mothers $n=250$). The families live in Copenhagen, have an infant age 2-10 months, and have been identified to experience difficulties in the first year of the baby's life by their health nurse during a regular home visit. Difficulties are identified as maternal symptoms of PPD measured using the Edinburg Postnatal Depression Scale (EPDS)[8] and/or the infant is at risk of social withdrawal measured with the Alarm Distress Baby Scale (ADBB)[9]. Following referral from the health nurse the family receives a home visit, where a five-minute video recording of parent-infant interaction is collected, which will be used for coding of parental sensitivity[10].

SUPERVISION

The PhD will be supervised by:

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REFERENCES


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CENTRE OF APPLIED SOCIAL PSYCHOLOGY research is focused on aspects of individualisation and identity development.

In researching these issues more theoretical perspectives and theories are important. But especially an activity theoretical perspective is used to understand how social and societal changes are influencing the individual activities or ‘answers’ which the individual develops according to late modern social integrative challenges.

This social psychological framing does not only look for understanding of how the individuals are influenced by social networks and societal possibilities or how ‘the individual is made social’. Rather this research is trying to find out how societal and social challenges is constructing the individual, or how ‘the social is made individual’.

In this perspective many issues are important. Both the construction of late modern children and adults individualisation and identity is of interest, but especially focus have been on youth development. Youth are inside a process of “individualisation in biography” and in this way youth development is both important for the theoretical understanding of individualisation and identity formation, but also for researching many challenges and problems in everyday life. The applied social psychological perspective in this way makes theoretical and empirical knowledge important tools for analysing new social and societal activities.

In the Centre one of common projects is about new developments in social responsibility. The late modern development is seen as deinstitutionalising traditional institutional structures and in this way making the individual itself responsible for the development of social cognitions and for individual choices and actions which before were institutional defined and normatively controlled. The development of individual self understanding and social responsibility in this way becomes a challenge for the individualisation and identity forming process. Research projects therefore look at the development of individualisation and social responsibility among late modern societal agents. And here focus have been on the development of cultural agency both among ‘local’ and ‘ethnic minority youth’.

The Centre therefore is interested in inviting PhD students to take part in the research going on in the social psychological research group.

Some of the issues which may be formulated in the projects could be: how ethnic minority children or young people in the institutional settings (nursery, school, youth clubs etc.) develops social responsibility and individual strategies for social integration with forms their cultural agency.

Also other aspects of late modern individualisation and identity development are welcome. Especially projects which research different aspects of how social categories as ‘cultural
belonging’, ‘social economical background’, ‘gender’ etc. is formed and influenced by social positioning.

FOR FURTHER INFORMATION CONTACT

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REFERENCES FROM THE CENTRE PROJECTS


The work and organisational psychology group welcomes applications for PhD scholarships within a variety of research areas. Applications could for example focus on:

- Psychosocial work environment (for example stress and well-being)
- Leadership (styles, behaviours, effects, changes)
- Innovation and creativity
- Organisational change and interventions
- Negative social relations at work (for example bullying, harassment, violence, threats)

Methodologically the group works both quantitatively and qualitatively.

The examples are samples of some of the research interests within the work and organisational psychology group, however they do not cover all research areas and interests of the group.

We urge candidates to visit the research group’s web site at: [http://psychology.ku.dk/research_groups/work_and_organizational_psychology/](http://psychology.ku.dk/research_groups/work_and_organizational_psychology/) and the individual researcher profiles to inform themselves about the current research interests within the group.