**Master thesis/Msci-Applied Cognitive Psychology**

(Updated May 2013: William L.G.Verschuur)

**(Th1) Title of the Project: The effect of lifestyle interventions on the performance of older adults.**

**Supervisor name:** Dr. G.P.H. Band  
**Course Requirement:**  
**Number of positions available:** 4  
**Description:** A large-scale study is about to start to test the effect of a set of lifestyle interventions on cognitive performance in the Leiden elderly. Among the interventions are game-training, physical fitness, meditation, social media and cultural immersion. Neuro-cognitive health of participants is tested in pretest and posttest. Internships and theses are possible for elements of this large-scale project.

**(Th2) Title of the Project: Optimizing surgery and surgery training**

**Supervisor name:** Dr. G.P.H. Band  
**Course Requirement:** Fulfillment or current participation in the courses: "Cognitive Ergonomics", and “The Art of Applying Psychology”.  
**Number of positions available:** 2  
**Description:** LUMC aims to improve patient safety by improving medical procedures and optimizing human factors. Image-guided surgery, endoscopy and other minimal invasive techniques (laparoscopy, endovascular techniques) have also introduced new challenges because normal eye-hand coordination has to be flexibly adapted, requiring specific spatial visual and motor skills such as mental, spatial, and size transformations of images and surgery actions. Is performance of surgeons limited by the laws of cognitive psychology, or is incompatibility only a minor obstacle for the plastic brain? And is it possible to accelerate the training of complex surgical skills, once it is clear what predicts spatial visuo-motor abilities?  
In this collaboration between the LUMC Department of Surgery and the Leiden University Cognitive Psychology unit, the first goal is to investigate determinants of individual differences in the ability to adopt new reference frames. Second, training progress in the skills lab will be monitored. The relationship between progress and cognitive predictors will be charted. Finally, cognitive functions with demonstrated predictive value (target functions) will be tested for trainability.  
The study will take place in collaboration between one medical student and one student in applied cognitive psychology. Experimental research will be conducted in a virtual surgery situation, with medical students and psychology students as participants. Subsequent studies may be extended to
charting predictors of actual surgery performance.

(Th3) Title of the Project: Situation awareness during flight Performance
Supervisor name: Dr. G.P.H. Band
Course Requirement: Fulfillment or current participation in the courses: "Cognitive Ergonomics", and "The Art of Applying Psychology". A strong statistics or psychophysiology course profile is appreciated but not required.
Number of positions available: 2
Description: Airlines such as KLM have a strong interest in maximizing aviation safety. Among aviation safety researchers, there is consensus that a pilot’s situation awareness (SA) is a strong predictor of flight performance, in particular in deviant conditions, and therefore of the risk of incidents in air flight. However, there is less consensus on the optimal technique to assess SA during either the training in a flight simulator, or in the reality of aviation. The student will therefore investigate and compare the available tools, investigate opportunities for improvements and validation of these tools, and make recommendations for training and assessment of pilots. As part of this endeavor, s/he will make use of large data sets of pilot characteristics, test scores and virtual and real flight performance. It is possible to validate the measures with new flight simulator results. The emphasis will lie on the optimization of techniques to derive better estimates of latent functions such as SA as predictors of flight performance. An alternative emphasis may lie at the application of physiological measures (stress-related indices).

(Th 4) Title: Physical fitness in older adults
Supervisor Name: Dr. G.P.H. Band
Course requirement: Human Potential: Theory, or Human Potential: Application
Language: Dutch
Number of positions available: 1
Location: Hersenstichting Nederland
Description: Hersenstichting Nederland (HSN) is a fund for scientific research on brain dysfunction. In addition, it aims to raise public awareness about brain dysfunction. In recent years, HSN has developed several brochures to summarize the state of knowledge on healthy behavior, for example about nutrition and the brain, training the brain, and physical activity. Because recent scientific research has revealed important clues about the role of physical activity, such as aerobic fitness training, for brain plasticity in healthy older adults, HSN would like to rewrite its brochure. The student is expected to perform a literature study, followed by interviews with experts to
reveal and describe the latest insights.

(Th 5): Diagnostic potential of computer games
Supervisor Name: Dr. G.P.H. Band
Course requirement: Commitment with neuropsychological testing and serious gaming. Above average statistical skills. Preferably as internship + thesis combined.
Location: Qiosq Rotterdam / Weert / at home / Univ. Leiden
Number of positions available: 2
Description: Qiosq is a company that develops low-threshold adaptive quizzes and games for use in care centers for demented older adults. As the games have shown to be very entertaining for the patients, the idea has arisen to explore the possibility of sandwiching psychodiagnostic tools into or between games. This could help personnel to recognize suspicious changes in individual performance across different cognitive domains. Students are expected to deliver the psychodiagnostic skills derived from commonly used tests, which will be implemented by technicians of Qiosq.

(Th 6): Light for cognitive enhancement
Supervisor Name: Dr. G.P.H. Band
Location: Philips research, Eindhoven
Requirements: EEG training, preferably Matlab experience, cognitive neuroscience
Period: 6-9 months (internship + thesis combined)
Description: Light has been proven to affect cognitive functioning both via its role as provider of visual information as well as its direct activating effects (bright light, oscillating light). The purpose of this assignment is to investigate properties of light relevant to memory, attention and other cognitive functions. Activities include literature review, familiarization with brain signal research (EEG), experimentation and analysis. Temporary housing in Eindhoven is facilitated for students working at Philips research.
NOTE: Philips Research starts new projects and finishes existing projects regularly. For a current overview of project options at Philips Research, contact Guido Band.

(Th 7): Sound and sleep
Supervisor Name: Guido Band
Location: Philips research, Eindhoven
Requirements: EEG training, preferably Matlab experience, cognitive neuroscience
Period: 6-9 months (internship + thesis combined)
Description: Several projects have been undertaken at Philips Research to understand the effect of disturbing and pleasant sounds on the sleep quality. The results of these projects showed that adding pleasant sounds to the
disturbing noise, although increasing the overall sound level, creates an
environment that is perceived by users as more appropriate to fall asleep in
than an environment with disturbing sounds only. However, relevant sleep
studies indicated that subjective measures of sleep quality and of sleep onset
latency often do not coincide with objective physiological measures (e.g.
actual sleep onset latency measured using EEG).

The goal of this project is to answer the following research question – What
are the objective effects of pleasant sounds on the sleep quality, if added to
a noisy environment or no sounds at all?

Only one aspect of sleep quality – sleep onset latency – will be investigated
in this project. You will need to analyze what is already known and has been
done in the previous relevant projects and then design and carry out a user
study to answer the main research question. More specifically, this implies
that you need to be able to do (an) experiment(s) exploiting the multiplesleep
latency protocol in which participants have to fall asleep multiple times
and have to wake them up based on real-time inspection of their EEG.

You need to design and construct the materials for such experiments, recruit
the participants, and complete their participation in our ExperienceLab sleep
lab. Data processing, analysis, and statistics are an integral part of the
project. Because your work will contribute to the existing body of work, a full
report is an essential deliverable of your project.

Temporary housing in Eindhoven is facilitated for students working at Philips
research.

NOTE: Philips Research starts new projects and finishes existing projects regularly.
For a current overview of project options at Philips Research, contact Guido Band.

(Th 8): Situation awareness in rail traffic controllers
Supervisor Name: Dr. G.P.H. Band
Location: TU Delft, ProRail Den Haag
Requirements: Cognitive Ergonomics
Description: At TU Delft, unit Policy, Organization, Law and Gaming, the
possibilities for optimizing the use of the Dutch railway infrastructure (at ProRail) are
investigated by means of simulation games. There is room for an internship, thesis or
both to investigate the social and cognitive psychological aspects of changes in the
infrastructure, such as crew resource management, and situation awareness.

(Th 9): Human potential of pilots
Supervisor Name: Dr. G.P.H. Band
Location: NLR Amsterdam (National Aerospace Laboratory)
Requirements: Cognitive Ergonomics
Description: At the aerospace lab there are possibilities on a regular basis to study the role of human factors in aviation. For a current impression of the options, contact Guido Band.

(Th 10): Title of the Project: Color psychology: the effect of red and blue on stopping on time

Supervisor name: Lorenza S. Colzato

Course Requirement: geen

Number of positions available: 3

Description: The color red is known to induce an arousing effect while the color blue is recognized to have a calming effect. In this project we will investigate the effect of these two colors on the ability to stop on time, a core cognitive control function.

(Th 11): Title of the Project: Food supplement tyrosine: a way to reverse drug-induced cognitive decline

Supervisor name: Lorenza S. Colzato

Course Requirement: geen

Number of positions available: 3

Description: The long term use of cocaine is known to reduce the availability of dopamine receptors and it is associated with cognitive decrements. In this project we will investigate whether the supplementation of the food-supplement tyrosine, the precursor of dopamine, may reverse the drug-induced cognitive decline.

(Th 12): Title of the Project: Optimizing efficiency of surgical training in laparoscopic motor skills

Supervisor name: E. N. Spruit MSc.

Course Requirement: Fulfillment or current participation in the courses: “Cognitive Ergonomics”, “Human Error at Work”, and “The Art of Applying Psychology”.

Number of positions available: 3

Description: LUMC aims to improve patient safety by improving medical procedures and optimizing human factors. Image-guided surgery, endoscopy and other minimal invasive techniques (laparoscopy, endovascular techniques) have also introduced new challenges because
normal eye-hand coordination has to be flexibly adapted, requiring specific perceptual and motor skills such as altered depth perception, size transformations of images and counter-intuitive motor actions. In this research project, the aim is to facilitate skill acquisition and retention and improve the efficiency of the current training curriculum of surgeons.

In this collaboration between the LUMC Department of Surgery and the Leiden University Cognitive Psychology unit, the goal is to investigate which training factors improve learning when trainees practice their basic laparoscopic skills on a surgical simulator. Data is collected at the Skillslab of the LUMC with the use of laparoscopic box trainers and video-recording equipment to track improvements in performance over time.

(Th 13): Title: Catching the eye with movies

Supervisor name: Marnix Naber

Requirements: Some experience with Matlab, Python, or C-related programming languages.

Number of positions available: 2

Description: When you walk through a shopping mall or when you watch television, some billboards and advertisements with bright colors seem to be striking while others do not even reach your awareness. Similarly, when you are driving a car or your bicycle to the university, the traffic signs may grab your attention while the appearance of the grey pavement is not of your interest. Here we question what is it that determines whether an object or design attracts your attention and comes into awareness.

Graphical designers, artists, and media producers often rely on their intuitive feelings when it comes to the conspicuity and saliency (i.e., eye-catching) of their designs. While intuition might be a useful guide for experts, it is a subjective process prone to error. Thus, designers are generally clueless why their designs are better than others in terms of saliency. A reoccurring design problem is thus the lack of knowledge of objective indicators that attract people’s attention.
One way to investigate saliency is to test how often a design attracts gaze by experimental participants. Such experiments are, however, time consuming and designers typically do not have the financial resources for such projects. A better alternative is to determine consistencies across designs that are known to attract attention and gaze. These consistencies are then implemented in a general computational model which can be applied on any design to investigate its saliency properties.

Many of such models exist and they accurately predict a person’s gaze by indicating the brightest, most colorful, and symmetrical parts in a stable design. These models start by converting a digital image as input and filter this into a so called “saliency map” that tells which parts of a design attract the most attention. The application of such models on dynamical inputs is, however, rare. In this project we develop a similar computational model that converts the input of movies into dynamical saliency maps. The aim is to make ultrafast and efficient predictions of gaze behavior in observers that view videos.

(Th 14): Selection by competition (or not?)

**Supervisor name:** Wido La Heij

**Requirements:**

**Number of positions available:**

**Description:** Models of language production often assume that in the process of word retrieval several candidate words compete for selection. For instance, when asked to name the picture of a chair, words like "table", "sit", and perhaps "stoel" compete with the correct word "chair" for selection and production. This competition was thought to be responsible for all kinds of "Stroop-like" interference effects in word-production tasks. Recently, however, this view was challenged by a group at Harvard University headed by Alfonzo Caramazza. This group proposed a new model (REH) in which Stroop-like interference effects are attributed to the removal of a distractor word from an output buffer. In the thesis project, predictions of the REH will be tested.

**Literature**


**Th 15: Title of the project: Enhancing cognitive control**

**Supervisor name:** Prof. Dr. B. Hommel

**Course Requirement:** Fulfillment or current participation in the courses: “Cognitive Ergonomics", "Human Error at Work", and “The Art of Applying Psychology".

**Number of positions available:** to be discussed

**Description:** Cognitive control functions are needed and responsible for configuring our cognitive system to achieve particular goals and carry out particular tasks. Current models assume that the individual performance characteristics of such functions are relatively constant and part of one’s personality and genetic makeup. However, recent observations suggest that control functions are systematically affected by people’s experience and social background (e.g., religion, sexual orientation, context), which again suggests that control functions are sensitive to training and practice. If so, it should be possible to develop training procedures that enhance people's ability to control and configure their own thoughts and actions. The aim of this project to develop such procedures, based on available evidence and theoretical frameworks.
(Th 16): Title of the project: Enhancing human creativity

Supervisor name: Prof. Dr. B. Hommel

Course Requirement: Fulfillment or current participation in the courses:
“Cognitive Ergonomics”, “Human Error at Work”, and “The Art of Applying Psychology”.

Number of positions available: to be discussed

Description: Human creativity is traditionally treated as a trait, which implies that there are creative and less creative people. However, recent findings from our lab suggest otherwise. Performance in creativity tasks is systematically affected by the task context, which suggests that it should be possible to train people to become more creative, at least to some degree.

The aim of this project to develop training procedures that are able to improve people’s creativity as far as possible.

(Th 17): Title of the Project: The effect of transcranial direct current stimulation (tDCS) on attention and cognitive control

Supervisor and contact: Sharon Zmigrod (szmigrod@fsw.leidenuniv.nl)

Faculty and Department: Faculty of Social and Behavioral Sciences (FSW), Institute of Psychology

Prerequisite knowledge/competencies:
Basic SPSS knowledge
Cognitive Neuroscience course or comparable

Number of positions available: 2

Description: Transcranial direct current stimulation (tDCS) is a non-invasive technique for modulating brain functions by inducing cortical excitability through weak direct currents. tDCS applied to the human cortex has been shown to modulate the excitability of a specific brain region. An increasing number of experimental data is available now both
for healthy participants and patients, providing evidence for short and long time effects in different domains of various cognitive functions. The aim of this study is to investigate whether tDCS over the parietal and frontal cortices can modulate cognitive control in healthy participants and older adults through various cognitive tasks.

(Th 18) Title: The impact of incentive saliency on goal-directed behavior

Supervisor and contact: dr. Henk van Steenbergen
(HvanSteenbergen@fsw.leidenuniv.nl)

Faculty and department: Faculty of Social and Behavioral Sciences (FSW), Institute of Psychology

Prerequisite knowledge/competencies:
Basic SPSS knowledge (e.g. repeated measures ANOVA)
Cognitive Neuroscience course or comparable knowledge (e.g. book Gazzaniga et al., 2008)
Experimentation II or comparable EEG training (only required if you would like to run an EEG experiment)

Description: According to the ideomotor theory of action control, perceptual action effects guide the selection of goal-directed behavior. In contrast, motivational accounts state that rewards drive action selection. Our integrative framework assumes that ideomotor and motivational mechanisms serve complementary purposes: 1) perceptual action effects prime all associated actions, and 2) which action is eventually selected depends on the associated reward values.

In the present study, we use the "differential outcomes effect" (DOE) to investigate whether incentive and perceptual salience increases instrumental learning based on expectancies of perceptual action effects. The DOE refers to the increased rate of learning of bi-conditional instrumental discriminations
when unique, differential outcome (or ‘action effects’) follows each type of
correct choice, as compared to a discrimination with a common outcome for
all-correct choices. Therefore, only in the DO discrimination can unique
perceptual action effects guide choice. If saliency and anticipation interact
positively in the control of action, the DOE should be enhanced when unique
perceptual action effects are associated with increased salience. Individual
differences in impulsivity and sensation seeking are hypothesized to predict
the impact of perceptual versus incentive saliency on the DOE.

This project uses behavioral tasks (programmed in E-Prime).
Depending on your background, it may be possible to include
physiological measurements as well (e.g. EEG).

Methods/techniques used: Reaction time measures (and physiological measures)

(Th19) Title of the Project: Decisionmaking of Older Drivers - A Driver
Simulator Study
Supervisor name: William L. G.Verschuur
Contact: verschuur@fsw.leidenuniv.nl
Course Requirement: n/a
Description: Older drivers are said to compensate for a decline in their
cognitive capabilities. But how are these decisions to compensate affected?
Compensation may occur on different levels of information processing
(strategic-, manoeuvring- and control level) which may result in a range of
decisions: to drive not at all, to avoid night-time driving, at rush hours or
busy city centers, not to take over on the highway or to drive slower. In
general it is expected that compensation may lead to a decrease in accident likelihood. Normal driving does not tax the cognitive capabilities of older drivers but the driving task may become more demanding, for example at a complicated junction, or when checking a route. Furthermore secondary tasks may interfere with the divided and selected attention necessary for the primary task i.e. maneuvring and control the vehicle. One of the research questions will be: what affects the decisions to compensate on the different levels of information processing?

**Driving simulator**

Apart from driving tracks (with varying degrees of difficulty) with the driving simulator older drivers’ cognitive skills and abilities will be tested, like divided and selective attention, dual task switching, acuity and ability on (timepressed) spatial tasks, subjective mental workload, perceived control and confidence in driving.


**(Th20) Title of the Project: Comparing younger and older drivers - A Driver Simulator Study**

**Supervisor name:** William L. G.Verschuur

Contact: verschuur@fsw.leidenuniv.nl

**Course Requirement:** n/a

**Description:** Younger drivers (aged 18-25) and older drivers (>50 y.) differ in driving performance as well as on errors, violations and involvement in accidents. For example younger drivers are overrepresented in traffic
fatalities compared to other age groups, violate traffic rules more often and have less driving experience than older drivers. Older drivers more often make lapses, may react more slowly in traffic situations, but violate less often than younger drivers. The general aim of this study is to compare both groups in the laboratory on driving performance and several other measures which may be predictive of their driving behaviour on the Lane Change Task (LCT).

Driving simulator

Apart from driving tracks (with varying degrees of difficulty) with the driving simulator younger and older drivers will be compared, i.e. their cognitive skills and abilities will be tested, like divided and selective attention, dual task switching, acuity and ability on (time-pressured) spatial tasks, subjective mental workload and perceived control and confidence in driving.


END OF THE LIST