

Master thesis/Msci-Applied Cognitive Psychology

(Updated September 2011-William L.G.Verschuur)

(Th1) Title of the Project: Optimizing surgery and surgery training: The role of spatial cognition

Supervisor name: Dr. G.P.H. Band

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 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.

(Th2) Title of the Project: Situation awareness as a predictor of flight performance

Supervisor name: Dr. G.P.H. Band

Course Requirement: Fulfillment or current participation in the courses: "Cognitive Ergonomics", "Human Error at Work", 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).

(Th3) Title of the Project: The effect of cognitive computer game training on the performance of activities of daily life.

Supervisor name: Jesse van Muijden
Course Requirement:
Number of positions available: 1

Description: Cognitive training programs are becoming increasingly popular. Recently, an online computer game training aimed at the improvement of executive functions in elderly people has been developed by psychologists at the University of Leiden. The outcome measures that are currently used to assess the effectiveness of the intervention are computerized psychological tasks performed in the laboratory. The effect of the intervention on how participants cope with everyday tasks, problems and stress in their 'natural habitat' has not been studied intensively, while that is an important determinant of the intervention's value. Investigating the effect of the intervention on ecologically valid measures of cognitive functioning is the core of this Master's project.

(Th4) Title of the Project: The effect of online brain training games (OBTGs) on cognition

Supervisor name: Jesse van Muijden
Course Requirement:
Number of positions available: 1

Description: The effect of online brain training games (OBTGs) on cognition is a hot topic in the cognitive enhancement literature. OBTGs are generally believed to be effective, but demonstrating this is hampered by a variety of methodological and technical requirements. Our new OBTG training research tool (<http://hersentraining.fsw.leidenuniv.nl>) has taken these requirements into account, so that a powerful test of OBTG effects on cognition is now possible.

The main goal of the research project is to test whether and how executive functions can be improved in healthy older adults in an entertaining fashion. In the light of the main project, several interesting possibilities for master's projects can be considered:

- Do older adults benefit from OBTGs to a greater extent than young adults?
- Is the effect of the intervention reduced if pre- and posttest assessments are conducted online instead of in the lab?
- What characteristics of an OBTG determine its success?
- Do benefits of OBTGs extend (transfer) from a lab task to demanding tasks in **daily life**?

(Th5) Title of the project: The efficiency of brain training in preserving cognitive control: can genetics predict individual differences?

Supervisor Name: Lorenza S. Colzato

Location: 2B.21

Course Requirement:-

Contact: colzato@fsw.leidenuniv.nl

Description: Very recently, in a provocative study, Owen and colleagues (2010) trained 11.430 participants online over a period of six weeks on cognitive tasks developed to improve reasoning, memory, planning, visuo-spatial skills, and attention. Even though the participants improved in every one of the trained tasks, unfortunately the benefit did not stretch to transfer effects to untrained tasks. The authors concluded that this provides: "no evidence to support the widely held belief that the regular use of computerized brain trainers improves general cognitive functioning in healthy participants beyond those tasks that are actually being trained." The purpose of the present thesis will be to investigate the possibility that successful transfer to untrained tasks in elderly people is modulated by preexisting neuro-developmental factors as genetic variability related to levels of the brain-derived neurotrophic factor (BDNF), an important neuromodulators underlying cognitive processes.

(Th6) Title: Evaluating the added value of the Extended investigation model

Supervisor: Jop Groeneweg

Location: 2A46

Course requirement: Cognitive ergonomics and Human Error 1

Description: On request of the Dutch Safety Board an accident investigation and analysis tool (Extended) has been developed to facilitate investigators in the process of identifying contributing factors of accident outside the 'traditional' domain of investigators. The next step in the development of the tool is to see if there is any added value of the new tool in terms of 'more information revealed' of 'more questions generated'. In close cooperation with the Dutch Safety Board, three 'old' investigations will be reanalysed with Extend to identify the gaps between the new and the old methodology. Generating ideas about a more userfriendly interface for Extended will also be part of the project.

(Th7) Title of the Project: Large scale accidents tools

Supervisor name: Jop Groeneweg

Course Requirement: -

Number of positions available:-

Description: Large scale accidents like the explosion on the Deepwaer Horizon platform and the subsequent emergency respons failures in April 2010 are investigated in depth by a range of organisations. In this thesis the main research question is, given the analysis made by BP, how complete is that analysis from a human factors perspective and can structural 'white spots' be identified. The BP analysis will be reevaluated using a tool (Extended) that has been developed at Leiden University in co-operation with the Dutch Safety Board. Next to this analysis additional information has to be obtained The student(s) is/are expected to be creative in their data collection method involving extensive search on the internet.

(Th8) 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. manoeuvring 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 (time-pressured) spatial tasks, subjective mental workload, perceived control and confidence in driving.

See Library, E-Journals: Accident Analysis & Prevention, Transportation Research Part F, Traffic Psychology and Behaviour, Ergonomics, Safety Science, Applied Cognitive Psychology.

(Th9) 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.

See Library, E-Journals: Accident Analysis & Prevention, Transportation Research Part F, Traffic Psychology and Behaviour, Ergonomics, Safety Science, Applied Cognitive Psychology.

(Th10) Title of the project: Action context bias in representation of objects

Supervisor name: Szilvia Biro
Course Requirements: (Experimentation I, module E-prime)
Number of positions: 1

Description: This project will investigate whether memory for an object's location vs. identity can be influenced by the type of action carried out on the object. It has been suggested that an action such as goal-directed reaching toward an object promotes the memory of spatiotemporal information (location). On the other hand, a communicative referential action such as pointing to an object may support memory of objects' surface features (identity). Such a bias in object processing mediated by the social context of the action has been shown to be present in 12 months old infants. It has been hypothesized that the dissociable memory for location and identity in infants may involve a lack of integration between the dorsal and ventral visual processing streams - that are assumed to subserve "where" versus "what" in object processing. This project aims to test whether action context may also serve as a bias in object processing in children or adults. A similar project with infants might also be an option.

(Th11) Title of the project: Infants' understanding of goal-directed actions

Supervisor name: Szilvia Biro
Course Requirements: none
Number of positions: 1

Description: To explain and predict the behavior of other people, that is, making sense the social world around, one needs to interpret actions in terms of goals. The project will investigate the origins of this ability in infancy. A growing body of evidence indicates that goal-directed action interpretation emerges during the first year of life. How this understanding develops is, however, still controversial. The project will investigate the time of onset of goal-directed action interpretations, the range of entities to which infants are willing to attribute goals, and the role of abstract behavioral cues and/or experience with particular actions play in generating such interpretations. Looking time measurements and/or eye-tracking apparatus will likely be used. Good social skills in communicating with parents and infants are essential.

(Th12) Title of the project: Eye movements as a measure of action understanding and action control in adults and infancy

Supervisor name: Szilvia Biro
Course Requirements: (Experimentation I, module E-prime)
Number of positions: 1

Description: Control over eye movements is present very early in infancy. Anticipatory eye movements, for example, can be used to test how infants or adults interpret observed actions. In this project, we will investigate the type of stimulus conditions under which infants and adults show pro-active goal-directed eye movements when they repeatedly watch simple actions directed toward a goal. Eye movement measures can also be used to see how infants and adults learn certain action-effect contingencies. We will look at how the control of eye movement is influenced by presenting action effects that were associated with different actions. Infants' eye movements will be measured by an eye-tracker apparatus. Flexible working hours, good social skills in communicating with parents and conducting experiments with infants are essential.

(Th13) Title of the project: Dyslexia and the Attentional Blink

Supervisor Name: Lorenza Colzato

Location: 2B05/MA Lab

Course Requirement: -

Description: Typical symptoms of dyslexia are the following:

▯ Confusion with before/after, right/left, over/under, and so on

▯ Difficulty distinguishing between similar sounds in words; mixing up sounds in multisyllable words (auditory discrimination) (for example, "aminal" for animal, "bisghetti" for spaghetti)

▯ Reversals of letters (b for d) and a reversal of words (saw for was) are typical among children who have dyslexia. Reversals are also common for children age 6 and younger who don't have dyslexia. But with dyslexia, the reversals persist.

This mixing-up and reversals of targets is a stable finding in the AB literature. Hommel & Akyürek (2005) found that subjects often confuse target order at short lags, especially if the two targets are equally easy to discriminate. In this study, compared to control subjects, we will expect dyslexic subjects to confuse the target order more often.

(Th14) Title of the project: Object-interference

Supervisor Name: Wido La Heij en Harrie Boelens (O&O)

Course Requirement: -

Description: Het kost kinderen van 5-7 meer tijd om de kleur van een herkenbaar plaatje dan van een abstracte tekening te benoemen (object-interference; Prevor & Diamond, 2005; Developmental Psychology). La Heij, Boelens & Kuipers (2010; Language and Cognitive Processes) en La Heij & Kuipers (in voorbereiding) hebben laten zien dat dit effect (a) niet het gevolg is van competitie tussen kleurnaam en plaatjenaam, (b) nog aanwezig is bij 8-jarigen, maar niet meer bij 12 en 16-jarigen en jong-volwassenen en (c) niet optreedt in sorteer- en tel-taken. De conclusie is dat het object-interferentie effect waarschijnlijk het gevolg is van competitie tussen taken. Kinderen missen nog het vermogen om deze taakcontrole effectief uit te voeren. In het voorgestelde project wordt deze hypothese verder onderzocht. Het onderzoek vindt plaats op basisscholen.

(Th15) Title of the Project: The effect of violent videogames on cognition

Supervisor name: Lorenza S. Colzato

Course Requirement: geen

Number of positions available: 2

Description: The interest in the influence of videogame experience on our daily life is constantly growing. "First Person Shooter" (FPS) games require players to develop a flexible mindset to rapidly react to fast moving visual and auditory stimuli, and to switch back and forth between different subtasks. This study investigated whether and to which degree experience with such videogames generalizes to other cognitive control tasks. In a previous study we let video game players (VGPs) and individuals with little to no

videogame experience (NVGPs) performed on a task switching paradigm that provides a relatively well-established diagnostic measure of cognitive flexibility. As found, VGPs showed smaller switching costs (i.e., greater cognitive flexibility) than NVGPs. Our findings support the idea that playing FPS games promotes cognitive flexibility. In this new study we will compare FPS games with dynamic 3D games (as for example Super Mario Galaxy 2) without aggressive content.

Paper: <http://frontiersin.org/psychology/cognition/paper/10.3389/fpsyg.2010.00013/>

(Th 16) Title of the project: Development of action control in infancy

Supervisor Name: Prof. Dr. Bernhard Hommel & Dr. Markus Paulus (Munich)

Location: Leiden University

Course Requirement: -

Description: It has been suggested that bidirectional action-effect associations (BAEA) subserve intentional action control. Little is known, however, whether and how preverbal infants acquire such BAEA (i.e. when infants perform an action do they know, by which effect it will be followed, e.g., shaking a rattle leads to a particular sound? And when they perceive an action's typical effect, e.g., the rattle sound, do they know that it has been the consequence of a particular action, e.g., the rattle action?). The present project aims at investigating whether infants acquire effector-specific BAEA. Infants will be trained to elicit a sound effect by a hand action and another sound effect by a foot action. After the training, both sounds will be presented to the infants. If infants have acquired effect-specific BAEA, they should show a greater activation in the hand's motor program when perceiving the sound that has been produced by the hand action, and greater activation in the foot's motor program when perceiving the sound that has been produced by the foot action.

(Th 17) Title of the project: Why do infants and toddlers imitate?

Supervisor Name: Prof. Dr. Bernhard Hommel & Dr. Markus Paulus (Munich)

Location: Leiden University

Course Requirement: -

Description: Different theories have been put forward to explain, why young children selectively imitate some actions, but not others. The present research project aims at investigating the relative impact of two proposed mechanisms and its change over development. One the hand, based on the idea that infants' social-cognitive development is driven by an innate sensitivity towards ostensive and pedagogical signals, it has been suggested that young children use a model's ostensive signals (e.g., eye-contact, infant-directed speech) to select the behaviors that should be necessarily imitated. On the other hand, research informed by the ideomotor approach to action control has proposed that infants' and toddlers' imitations is guided by salient (i.e. "interesting") action effects. Within this project the impact of ostensive signals and salient action effects on the imitative performance of children of two age groups (e.g., 18 months, 36 months) will be examined.

(Th 18) Title: Physical fitness in older adults

Course requirement: Cognitive Aging or Human Potential: Theory

Language: Dutch

Number of positions available: 1

Location: Hersenstichting Nederland

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. (<http://www.hersenstichting.nl/shop/gezonde%20hersenen/index.html>)

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.

Contact: Guido Band

(Th 19): Diagnostic potential of computer games

Requirements: Commitment with neuropsychological testing and serious gaming. Above average statistical skills.

Location: Qiosq Rotterdam / Weert / at home / Univ. Leiden

Preferably as internship + thesis combined.

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.

Contact: Guido Band

(Th 20): Light for cognitive enhancement

Location: Philips research, Eindhoven

Requirements: EEG training, Matlab experience, cognitive neuroscience

Period: 6-9 months (internship + thesis combined)

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.

Contact: Guido Band

(Th 21): Sound and sleep

Location: Philips research, Eindhoven

Requirements: EEG training, Matlab experience, cognitive neuroscience

Period: 6-9 months (internship + thesis combined)

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 multiple-sleep latency protocol in which participants have to fall asleep multiple times and you 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.

Contact: Guido Band

(Th 22): Effectivity of brain games

Location: Dezzel media, Baarn

In this project you investigate user behavior in online brain training games developed by Dezzel. You also investigate the effectivity of the games for enhancing cognition. This involves developing tests, collecting and analyzing data.

Contact: Guido Band

END OF THE LIST