

IFSMA-SCORE

Hvidovre Hospital,
Copenhagen, Denmark



長庚大學 醫學五 陳冠仔

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Exchange Condition

Who: Grace Kuanyu Chen

From: The Apartment of Medicine, Chang Gung University, Taiwan

To: ContAct, Danish Research Center of Magnetic Resonance,
Hvidovre Hospital, Copenhagen, Denmark

Period: 2013.07.28-2013.08.23

Danish Research Center of Magnetic Resonance (DRCMR)



DRCMR aims to provide first class clinical examinations and to advance the use of magnetic resonance as a clinical and investigative tool. They integrate The clinical work and research is integrated for the benefit of the patients.

ContAct (CONTRol of ACTION)

ContAct is a research group funded by a grant of excellence from the Lundbeck-Foundation, given to Prof. Hartwig Siebner for the period of 2011-2015. It is divided into six work packages which use different methods and tackle different aspects of the CONTRol of ACTION.

They investigate the ability of the human brain to flexibly integrate relevant contextual dimensions into appropriate actions. A better understanding of the neural mechanisms

mediating such a flexible control of actions is of central relevance to neuroscience. The groups research represents a critical step towards a mechanistic understanding of the brain networks supporting the flexible control of actions.

It's research program integrates advanced brain mapping, transcranial magnetic stimulation (TMS), pattern classification and advanced modeling to identify neural interactions that determine predictive, inhibitory and intentional aspects of action control. Since these are often severely affected in neurological and psychiatric diseases, their identification will be of great value for defining targets for future therapeutic interventions aiming at restoring action control in patients (e.g. Parkinson disease or stroke).



<information from <http://www.drcmr.dk/> & <http://contact.drcmr.dk/> >

The Link between Internal Decision and Motor Cortex



We use TMS (Transcranial Magnetic Stimulation) combined with Neural Navigator to localize the motor cortex which controls the movement of the subjects' right index finger, we call this spot hot spot. After that, we find the threshold for resting potential with the assistant of Adaptive PEST TMS motor threshold assessment tool. Later on, we will fasten the TMS coil on the spot and then the experiment starts! The subjects are asked to play a dice game designed with Psychopy. Every time before the subjects make a decision to continue or not, the TMS machine sends out stimulation which is 1.2 times of the threshold, to make sure that the action is always evoked and every potential will be recorded by a MEP signal recorder. After thirty minutes of the game, the experiment is finished!

This day, I volunteered to be one of the "pilot" subjects, to go over all the steps and make sure everything is fine. It was really cool to see the movements of your hand controlled by TMS, which is not harmful if you do not have the history of or chance to have epilepsy. TMS is now a common and more acceptable equipment used to stimulate areas in the brain for experiment and research for neuroscience.

Combination of TMS and fMRI



This is another research which aims to find out the role of premotor area in action making. We use the same equipments to find out the motor cortex which controls the movements of the right index finger too. What is different is that, instead of the threshold of resting potential, what we want this time is that of activation potential. Subjects will be asked to make their best effort to force the index finger toward a box, and then, the intensity to be activated is set. After we find the activation potential, we mark the site of the motor cortex hot spot and the premotor cortex which is 2 cm forward and 1 cm right from the hot spot. With the mark of the hot spot and activation threshold, we can now move to the MRI room! Inside the scanner, with the subjects laying down, the TMS coil is also fastened, to where it can precisely stimulate the premotor cortex all the time. The subjects are asked to do a Go-No-Go Task with TMS stimulating in a sequence of five times every time before they make an action. At the same time, the brain is scanned by functional MRI (fMRI), with which we can observe the areas in the brain being activated.

I volunteered to be the pilot subject in this experiment again! In which I got a scanned image of my brain! It was a really cool experience and maybe an once in a life chance to be inside of a MRI scanner!

Rubber Hand Illusion (RHI)



The Illusion

When a person views stimulation of a rubber hand while feeling congruent stimulation of his/her own hand, he/she may come to feel that the rubber hand is part of his/her own body. This was discovered by Matthew Botvinick and Jonathan Cohen in 1998.

The Causes

It is a three way interaction between vision, touch and proprioception. A sense of ownership arises due to the matching visual and tactile stimulation, subjects then take the viewed rubber hand as their own hand. One consequence of the illusion is that the viewed location of the rubber hand adapts the proprioceptively perceived location of their own hand. Scientists also found the cells in the premotor cortex of monkeys which respond both to tactile stimulation of a particular body region and to visual perception of an object approaching that area. The connectionist network referred to above features a layer of units with analogous response properties, units that appear to be necessary for the relevant cross-modal interactions to occur.

<Reference: p.756 NATURE VOL 391 | 19 FEBRUARY 1998 >

Functional MRI Investigation

fMRI studies investigating the RHI have suggested brain areas that may be involved in the illusion. The RHI is associated with increased metabolism, predominantly in the cerebellum and parietal, insular, premotor and frontal opercular regions of the cerebral cortex. Increased blood-oxygen-level-dependent (BOLD) fMRI responses in the premotor cortex have been associated with the subjective experience of bodily ownership and the strength of the illusion when the RHI is elicited.

True Experience

The stimulation we chose was to brush my index finger simultaneously with brushing the index finger of the rubber hand with two paintbrushes. I can only see the rubber hand but not my hand being brushed with a board separating the two hands. In the beginning, I thought I was not going to get the illusion, however, after about one minute, the feeling came without any signal. It seemed as though the touch I felt was caused by the paintbrush touching the rubber hand! Just as the saying goes "To see is to believe", we happen to believe in what we see more than what we feel, which is really interesting!!

Clinical Applications

Psychiatric disorders

RHI is enhanced in schizophrenic patients compared to controls, with regard to the strength as well as the rapidity of onset of the illusion. It has been postulated that individuals whose body image is more easily and convincingly altered by the RHI would have an inherently unstable and hence easily malleable perceptual body image. Consistent with this hypothesis, individual differences in the strength of the RHI can predict the level of engagement in bingeing and purging behavior as well as the level of muscle development, exercise and chemical supplement use. Ideally, this type of finding could aid identification of those individuals who would be most responsive to therapies designed to correct inaccurate body perceptions.

Limb amputation

The RHI has been shown to occur in people with upper limb amputation, when the hidden stump is touched in synchrony with the index finger of a viewed rubber hand. Neuroprostheses could be designed with tactile sensors on the artificial limb, connected to tactile stimulators on the stump to reproduce and maintain the illusion. A sense of ownership of the limb may make the prosthesis easier and more intuitive to use. This technology could also reduce body dissatisfaction as the person with amputation would not be constantly reminded of the artificial limb.

<[Reference: The rubber hand illusion and its application to clinical neuroscience](#)
[Hari Ramakona](#) [a](#), [Elizabeth A. Franz](#) [b](#), [Christopher R.P. Lind](#)>

Preparation & During the Course

Denmark is a beautiful country of history and culture. I enjoyed every city I've visited very much, including Copenhagen, Odense, Aarhus, Aalborg and Skagen. They have their own characteristics and atmosphere, which are very interesting! Copenhagen is the city I stayed in most of the time. Although a bit expensive, it is definitely a well-functioning and a foreigner-friendly city. The weather is brilliant in Denmark during August, even better than July.

About flight tickets booking

It's very convenient to visit Denmark now, since you don't need a visa but only a medical insurance for at least 3,000 EUR. To book the cheapest flight, book as early as possible is always the rule. However, due to the administrative proceedings of our school this year, we couldn't book the flight as early as we received our confirmation letter. Some exchangers in June even got their tickets booked just a week before they departed, which caused a huge inconvenience. That was not my case, since my exchange was in August, but I did get more expensive tickets. Undoubtedly, we have to sort out a better way to book tickets.

About communication with contact person

I didn't get a contact person until 2 weeks before my exchange. Before this, I contacted with the NOREs and LOREs there whenever I had problems, and their responses were fast and in details. My contact person was also very nice. She picked me up at the airport and brought me to the place that I was going to stay. She even invited me to her place for dinner and took me around the city.

About the Social Programs

I attended one of the two social programs, which was held in Aalborg. It was very organized. The LORE there posted information in our Facebook Group very early in July. They also helped us book the hotels and arranged the city guide. The dinner and the party after that were even brilliant! Thanks to them very much! However, as I have known, the one in Odense was not that good. We had waited for a long time until we got the information. Exchange students in Aarhus even got the information just the day before. And we had to book the hotel ourselves, which was very inconvenient. All in all, it depends on how lucky you are, the LORE you meet, to have what kind of social programs. It is always a good choice to make plans in advance, so that you won't have a blank weekend.

All you need to live in Copenhagen



FlexCard - 30 days (DSB station)

With this, you have unlimited access to journeys by bus, train and the Metro in the number of zones you pay for. You can get a better price if you buy it with your photo on it, which means it is a private card.:)



Eurail Pass (飛達旅遊)

Very useful if you're going to travel to many places in Denmark! I bought the one which can be used in any seven days in a month, which costs 117 EUR. Comparing to the money I would have spent without this, I just spent half the price! < The pass could only be bought in Taiwan, before you depart! >



SIM card - Lebara (7-11)

This card costs you 50 DKK and you will have 10 DKK to call and text. You can top up any time in any 7-11, at least 50 DKK a time. But since it's free to phone or text if your friend is also using Lebara, 10 DKK is very enough for your stay in Denmark.

Visiting Places in Denmark



Copenhagen-Den Lille Havfrue



Copenhagen-Nyhavn



Helsingor-Kronborg



Humlebaek-Louisiana Museum



Odense-H.C. Andersen



Billund-Legoland



Aalborg-The Bar Street



Skagen-Grenen



Aarhus-The Deer Park



Aarhus-Den Gamle By



Aarhus-ARoS Museum



Hillerod-Frederiksborg Slot

Summary

Living

Copenhagen is said to be a box full of crayon, where you can experience different cultures from different areas all over the city. It definitely is. Every area has its own story to tell. You can know more as you step in to all kinds of museums. With the countless museums, you will always have somewhere to go in your free time.

It has well-established public transportation, where trains, metros, and buses are perfectly connected to one another. The best thing is that they are all 24 hour-running. You never need to worry the transportation from place to place. You can also ride bicycle everywhere since all the roads and streets have cycle pathway. In fact, bicycle is the most common vehicle that people in Copenhagen use.

Staying a month in the city is very different from traveling, therefore, choosing the city you would love to stay for that long is very important. Copenhagen is modern and at the same time classical. Different from the crowdedness in Taiwan, I always felt fresh and relax. This is indeed one of the best months I have ever had.

Learning

Learning in the research center is very autonomous and of freedom. I could get access to any project as I would like to. There was no language barrier since professors and students in the research center all spoke perfect English. While testing subjects, although they explained the whole progress to the subjects in Danish, they made sure that I had understood everything in advanced, which was what I really appreciated.

I volunteered to be the pilot subject of a few of the projects, in which I experienced TMS and MRI. In this way, I could explain more details feelings to my patients who are going to have TMS or MRI. The techniques I have learned would also benefit my further studies in neuroscience.

The department you choose determines how your life this month will be. The more you are interested, the more you will learn, and the more fulfilling you will be. Otherwise, you will find your weekdays torturing. I recommend that you can write directly to the supervising tutor if you want to get more information about the project.

Making Friends (Social Programs)

Another brilliant thing for the exchange program is that I made many new friends from all over the world! Not only in the social program, we also kept in touch to spend time in the city together every day after work. However, social program is the one you should never miss! Exchangers from every city in Denmark gather together in a city to play and party together! In Denmark, there will be 2 social programs in different cities in both July and August respectively. Which means, there will be a total of 4 social programs, and you would have the chances to attend two of them. I was very lucky that the social program this year in August took places in the cities that I wasn't staying, which were Odense and Aalborg. Nevertheless, it is definitely ok that you don't attend the social programs and travel around yourself. My opinion is that, it definitely worths it for you to attend at least one of them, to know more people, and to make more friends.

Traveling

This is an indispensable part of the journey, either before or after the exchange program. You can either find a partner or go by yourself. I got contact with another girl who was also going to do her exchange in Denmark in August and would like to travel with me. We decided the places to travel and sorted out everything through Facebook. Though traveling with a person you had never known before has its risks, I must say, I was surprised too, that I made a very good friend. We went all the way from Helsinki to Rovaniemi to Stockholm, and then back to Copenhagen. Although they were all northern Europe countries, they had their own characteristics. In fact, I think it's a pretty great idea to see all of them during a trip. In that way, you can know more completely about the whole Scandinavia. The weather, the people, and the scenery are all that you should experience at least once in a life. Everything seems hard before you start, but once you start, anything can be solve. Learn to plan the whole journey is indeed challenging and self-fulfilling!