# Default Mode Network activity in relation to Mind Wandering and EEG theta/beta ratio

Published: 16-06-2017 Last updated: 12-04-2024

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Ethical review	Approved WMO
Status	Recruiting
Health condition type	Other condition
Study type	Observational non invasive

# Summary

### ID

NL-OMON45554

**Source** ToetsingOnline

Brief title DMN related to MW and TBR

### Condition

• Other condition

**Synonym** no diseases; healthy participants only

#### **Health condition**

betreft standaard EEG en MRI onderzoek zonder medische toepassingen

#### **Research involving**

Human

### **Sponsors and support**

Primary sponsor: Universiteit Leiden Source(s) of monetary or material Support: VIDI grant Dr. P. Putman

### Intervention

Keyword: Default Mode Network, EEG theta/beta ratio, fMRI, Mind Wandering

### **Outcome measures**

#### **Primary outcome**

- resting state EEG theta/beta ratio during mind wandering episodes
- DMN activity during mind wandering episodes
- relation between general resting state theta/beta ratio and attentional

control

- relation between theta/beta ratio during mind wandering and attentional

control

#### Secondary outcome

NA

# **Study description**

#### **Background summary**

In spontaneous (resting state) EEG, the ratio between power in the slow frequency bands (theta) and the fast frequency bands (beta), known as the theta/beta ratio (TBR) has already directly been negatively related to executive control like attentional control (Putman et al., 2010, Putman et al., 2014; Angelidis et al., 2016; Angelidis et al. (in submission); van Son et al., (in preparation)). A study by Braboszcz & Delorme (2011) found that increased theta power and reduced beta power (increased TBR) was specifically present during mind wandering episodes, and in turn lower theta and higher beta power during on-task periods. Thus, increased TBR is likely also related to off task processing. Mind wandering itself is described as a deficit in working memory and attentional control (McVay & Kane, 2009) and a predictor for performance errors (Smallwood & Schooler, 2006). Based on these findings, the regularly observed relation between measurements of spontaneous TBR and attentional control is possibly caused by episodes of mind wandering increasing the average TBR in people with worse attentional control. Studying this latter hypothesis would greatly benefit research on TBR, in healthy people (e.g. Wischnewski et al., 2016) and ADHD alike (elevated TBR in ADHD is a robust finding; see Arns et al., 2013, for a meta-analysis).

Focused states such as meditation or mindfulness (commonly seen as a focused on-task process; opposite of the \*off task\* state of mind wandering) have been related to a reduced activation of the default mode network (DMN; Garrison et al., 2015; Brewer et al., 2011). Additionally, mind wandering was found to directly activate the DMN (Karapanagiotidis et al., 2017; Smallwood et al., 2008), making activity of the DMN a possible indicator of mind wandering processes at the time of activity. This study therefore aims to investigate mind wandering as an underlying responsible mechanism for the negative relation between TBR and attentional control.

#### **Study objective**

The first objective of this study is to replicate Braboszcz & Delorme (2011) and see whether a mind wandering episode is indeed associated with increased TBR (increased theta and reduced beta). The second objective is whether the procedurally identically assessed mind wandering episodes are linked to an increase in DMN coherent activity, as measured during fMRI scanning. The third and most important objective is to test the hypothesis that quantification of the EEG TBR change during mind wandering is positively correlated to fMRI DMN activation during mind wandering. This could greatly increase our understanding of the functional and neural mechanisms of spontaneous TBR and its relation to executive control.

### Study design

This study will be a within subjects observational design. First, a baseline resting-state EEG measurement is done for eight minutes. Subjects will then perform a 40 minute breath counting task as in Braboszcz & Delorme (2011) when EEG is measured. Subsequently, on a different day within a week (the one- week re-test reliability for TBR is as high as 0.93; see Angelidis et al., 2016) a certain amount of participants will perform the same 40 minute breath counting task in an MRI scanner while brain activity is measured. Participants who during the EEG session report an insufficient number of mind wandering episodes for reliable statistical analyses, will be excluded from the MRI session.

### Study burden and risks

NA; no risks

# Contacts

**Public** Universiteit Leiden

Wassenaarseweg 52 Leiden 2333AK NL **Scientific** Universiteit Leiden

Wassenaarseweg 52 Leiden 2333AK NL

# **Trial sites**

## **Listed location countries**

Netherlands

# **Eligibility criteria**

#### Age

Adults (18-64 years) Elderly (65 years and older)

### **Inclusion criteria**

- Age 18-30 years
- No history of neurological disorder/disease and no counter-indications to MRI
- No history of excessive substance use or substance addiction.

### **Exclusion criteria**

- contraindications for fMRI, which include metal implants, heart arrhythmia, claustrophobia, and possible pregnancy (in females).

- head trauma, history of neurological or psychiatric illness

# Study design

### Design

Study type: Observational non invasive		
Masking:	Open (masking not used)	
Control:	Uncontrolled	
Primary purpose:	Other	

### Recruitment

NL	
Recruitment status:	Recruiting
Start date (anticipated):	30-06-2017
Enrollment:	40
Туре:	Actual

# **Ethics review**

Approved WMO	
Date:	16-06-2017
Application type:	First submission
Review commission:	METC Leiden-Den Haag-Delft (Leiden)
	metc-ldd@lumc.nl

# **Study registrations**

### Followed up by the following (possibly more current) registration

No registrations found.

### Other (possibly less up-to-date) registrations in this register

No registrations found.

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# In other registers

### Register

ССМО

**ID** NL60748.058.17