

Medial Septal Projections to the Parasubiculum

Inaugural-Dissertation
to obtain the academic degree
Doctor rerum naturalium (Dr. rer. nat.)

submitted to the Department of Biology, Chemistry and Pharmacy
of Freie Universität Berlin by

Daniel Parthier

18.02.2021

Contents

1	Prerequisites	5
2	Introduction	7
2.1	Theta	7
2.2	Medial Septum	7
2.3	Parasubiculum	8
2.4	Spatial Navigation	8
3	Materials and Methods	11
3.1	In-Vitro	11
4	Results	13
5	Discussion	15

1

Prerequisites

The experimental work of this thesis was completed from xx.xx.xx to xx.xx.xx under the supervision of Prof. Dr. Dietmar Schmitz at the Neuroscience Research Centre (NWFZ) of the Charité.

2

Introduction

2.1 Theta

2.2 Medial Septum

The medial septum (MS) a structure located in the forebrain (Figure 2.1) can be found across species.

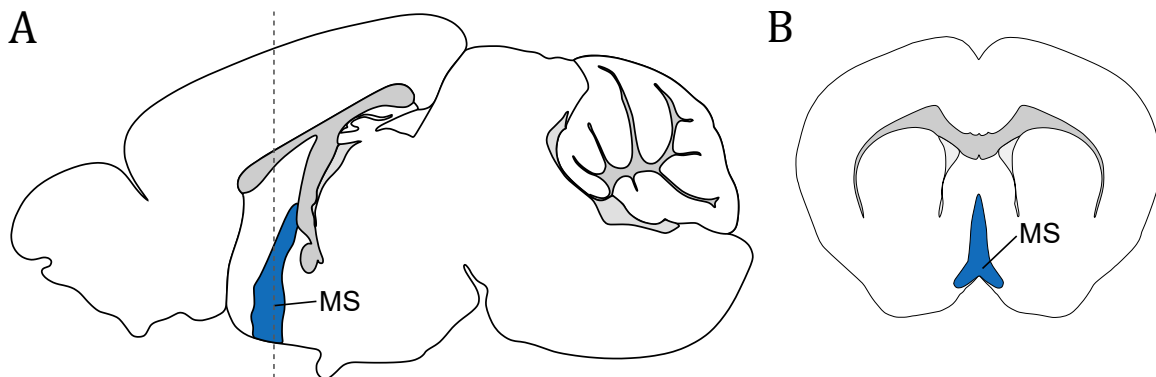


Figure 2.1: Schematic of medial septum in sagittal (A) and coronal (B) section. Blue shows the location of the MS, light gray represents ventricular space and dark gray fibre bundles. The dashed line in (A) indicates the position of the section of (B). Modified from Allen Brain Atlas.

2.3 Parasubiculum

The parasubiculum (PaS) on the other hand is part of the parahippocampal formation (Figure 2.2), the posterior part of the mouse brain, and is found in different species (Ding, 2013). It is adjacent to the medial entorhinal cortex and presubiculum which, as the PaS, have spatially linked functional cell types coding for different aspects used for navigation (Citation needed).

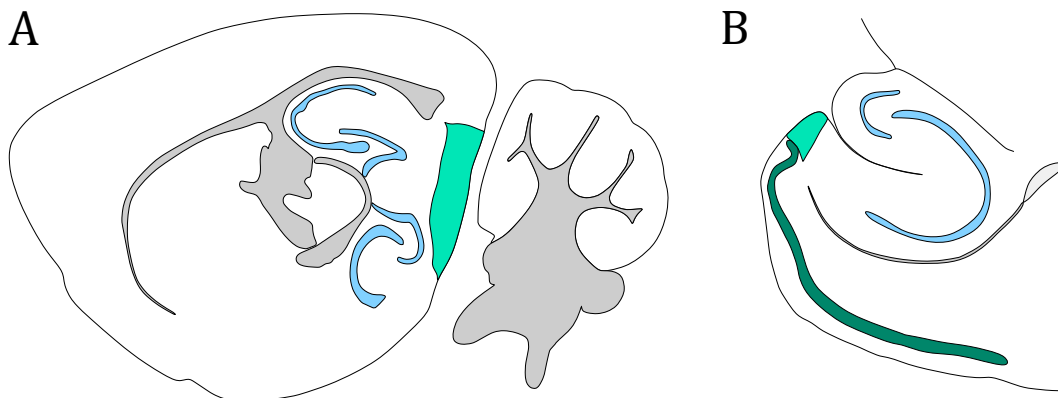


Figure 2.2: Schematic of parasubiculum in a sagittal (A) and horizontal (B) section. turquoise shows the location of the PaS, light gray represents ventricular space and dark gray fibre bundles. The dark green in (B) represents the pyramidal cell layer II of the medial entorhinal cortex. The cornu ammonis and the dentate gyrus are marked in light blue.

2.4 Spatial Navigation

2.4.1 Theta

You can label chapter and section titles using {#label} after them, e.g., we can reference Chapter 2. If you do not manually label them, there will be automatic labels anyway, e.g., Chapter ??.

Figures and tables with captions will be placed in figure and table environments, respectively.

```
par(mar = c(4, 4, .1, .1))
plot(pressure, type = 'b', pch = 19)
```

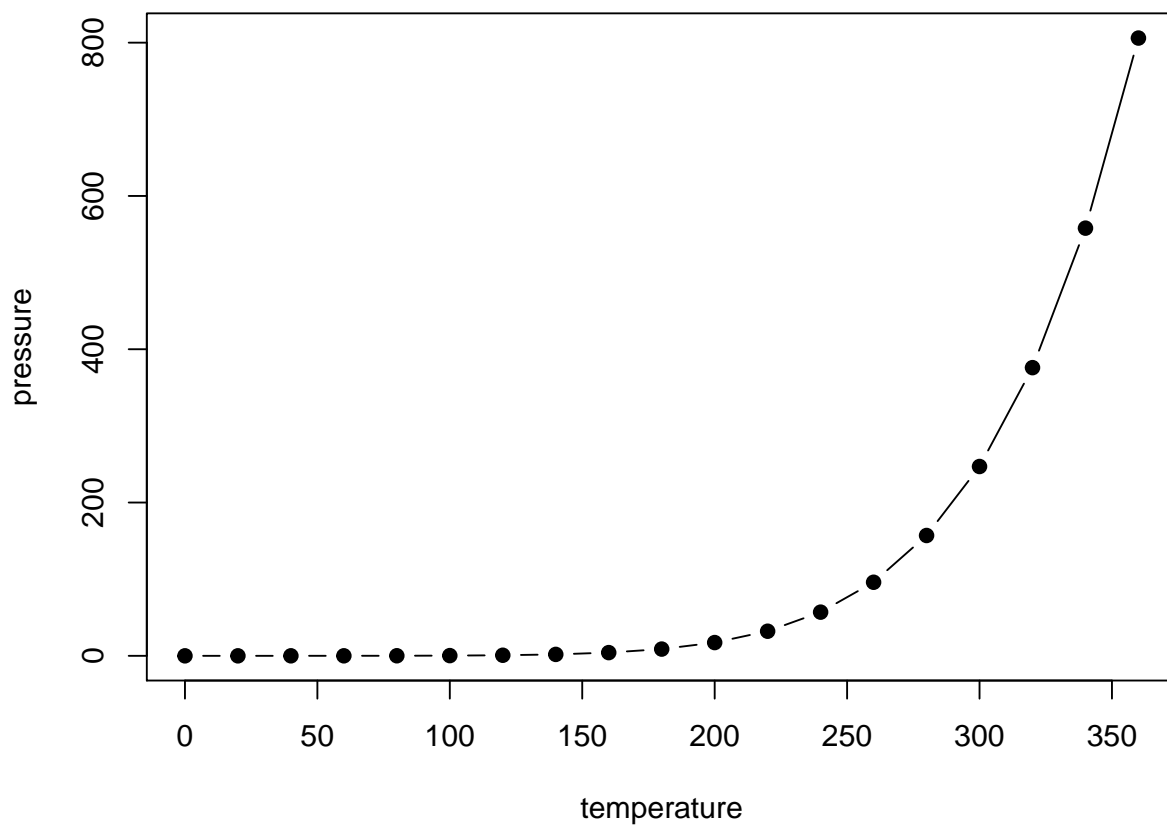



Figure 2.3: Here is a nice figure!

Table 2.1: Here is a nice table!

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5.0	3.4	1.5	0.2	setosa
4.4	2.9	1.4	0.2	setosa
4.9	3.1	1.5	0.1	setosa
5.4	3.7	1.5	0.2	setosa
4.8	3.4	1.6	0.2	setosa
4.8	3.0	1.4	0.1	setosa
4.3	3.0	1.1	0.1	setosa
5.8	4.0	1.2	0.2	setosa
5.7	4.4	1.5	0.4	setosa
5.4	3.9	1.3	0.4	setosa
5.1	3.5	1.4	0.3	setosa
5.7	3.8	1.7	0.3	setosa
5.1	3.8	1.5	0.3	setosa

Reference a figure by its code chunk label with the `fig:` prefix, e.g., see Figure 2.3. Similarly, you can reference tables generated from `knitr::kable()`, e.g., see Table 2.1.

```
knitr::kable(  
  head(iris, 20), caption = 'Here is a nice table!',  
  booktabs = TRUE  
)
```

look at figure 2.3

You can write citations, too. For example, we are using the bookdown package (Xie, 2020) in this sample book, which was built on top of R Markdown and knitr (Xie, 2015).

3

Materials and Methods

3.1 In-Vitro

3.1.1 Slice Preparation

For slices animals (n = XX PV-Cre mice, n = XX ChAT-Cre mice) were deeply anaesthetised using isoflurane decapitated, the brain removed and quickly transferred to ice-cold slicing solution. sucrose artificial cerebral spinal fluid (SACF). SACF contained 87 NaCl, 26 NaHCO₃, 10 Glucose, 50 Sucrose, 2.5 KCl, 1.25 NaH₂PO₄, 0.5 CaCl₂, 3 MgCl₂ · 6H₂O. 400 µm horizontal slices were produced using a vibratome (VT1200S, Leica Biosystems, Wetzlar, Germany), then transferred and stored in an interface chamber for up to 1-6 h. Slices were perfused with ACSF (119 NaCl, 26 NaHCO₃, 10 Glucose, 2.5 KCl, 1 NaH₂PO₄, 2.5 CaCl₂, 1.3 MgCl₂ · 6H₂O) and oxygenated during the whole period.

3.1.2 Slice Recordings

Cells where identified using XXXX DIC XXXX and recorded using a glass electrode filled with intracellular solution (120 K-Gluconate, 10 Hepes, 10 KCl, 5 EGTA, 2 MgSO₄ · 7H₂O, 3 MgATP, 1 NaGTP, 5 Phosphocreatine Na, 0.2% Biocytin) to record currents, voltage and later identify cells via Biocytin staining.

all in c/mM

Drugs used:

4

Results

Here is a review of existing methods.

5

Discussion

Here is a review of existing methods.

Bibliography

Ding, S.-L. L. (2013). Comparative anatomy of the prosubiculum, subiculum, presubiculum, postsubiculum, and parasubiculum in human, monkey, and rodent. *The Journal of comparative neurology*, 521(18):4145–62.

Xie, Y. (2015). *Dynamic Documents with R and knitr*. Chapman and Hall/CRC, Boca Raton, Florida, 2nd edition. ISBN 978-1498716963.

Xie, Y. (2020). *bookdown: Authoring Books and Technical Documents with R Markdown*. R package version 0.21.