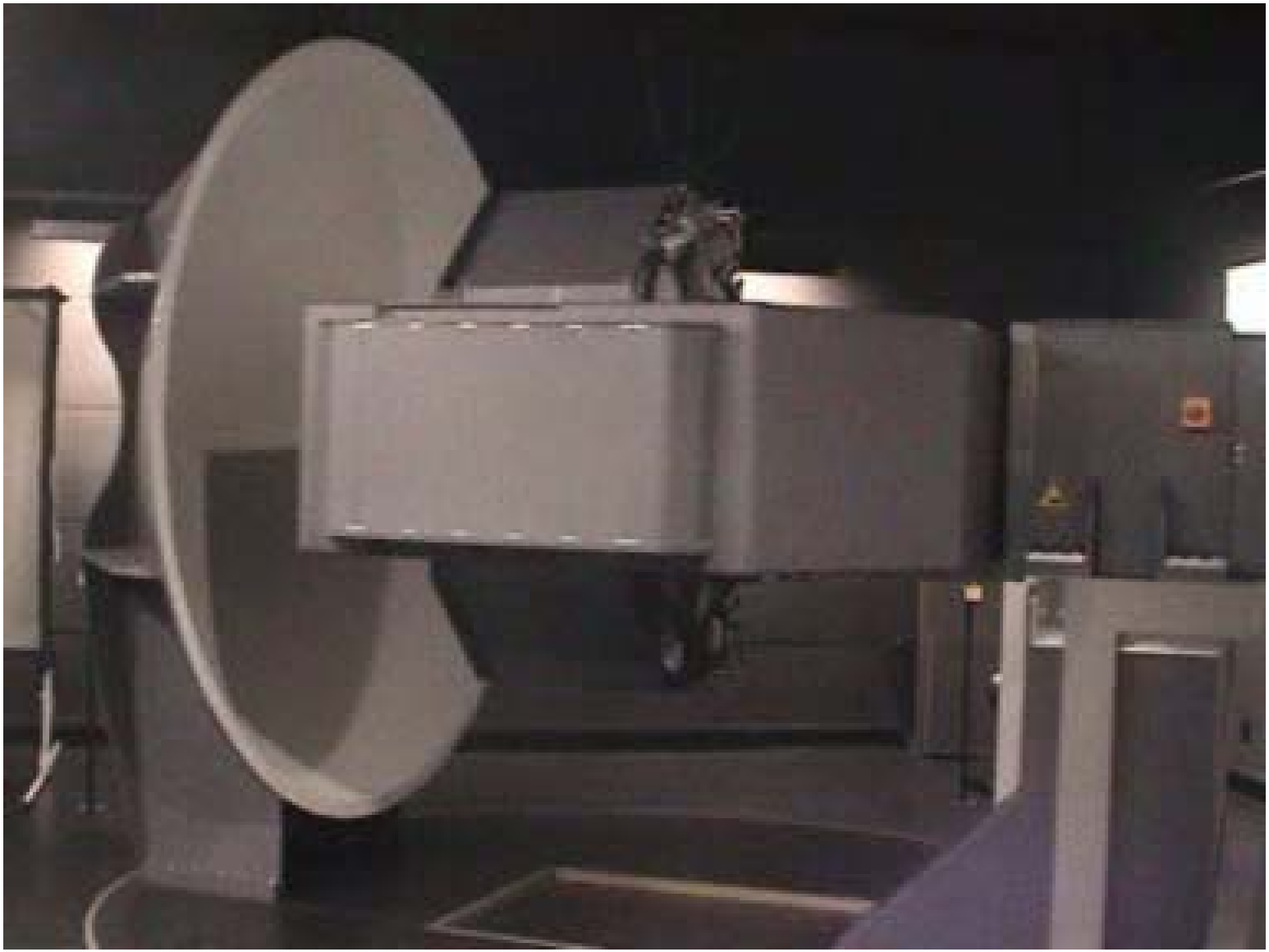
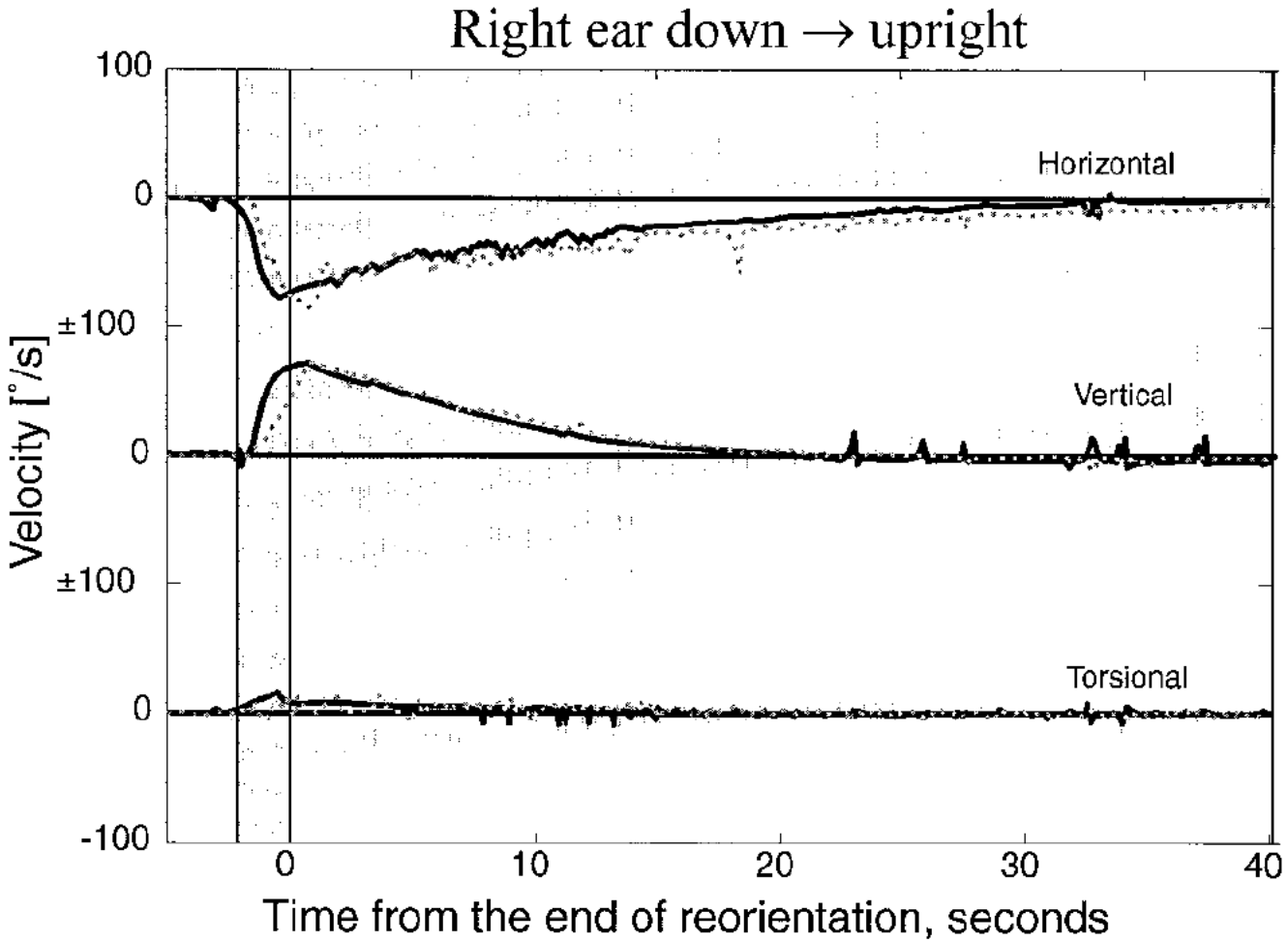
Der vestibulo-okuläre Reflex (VOR) und seine klinische Bedeutung

Dominik Straumann
Neurologische Klinik
Universitätsspital Zürich

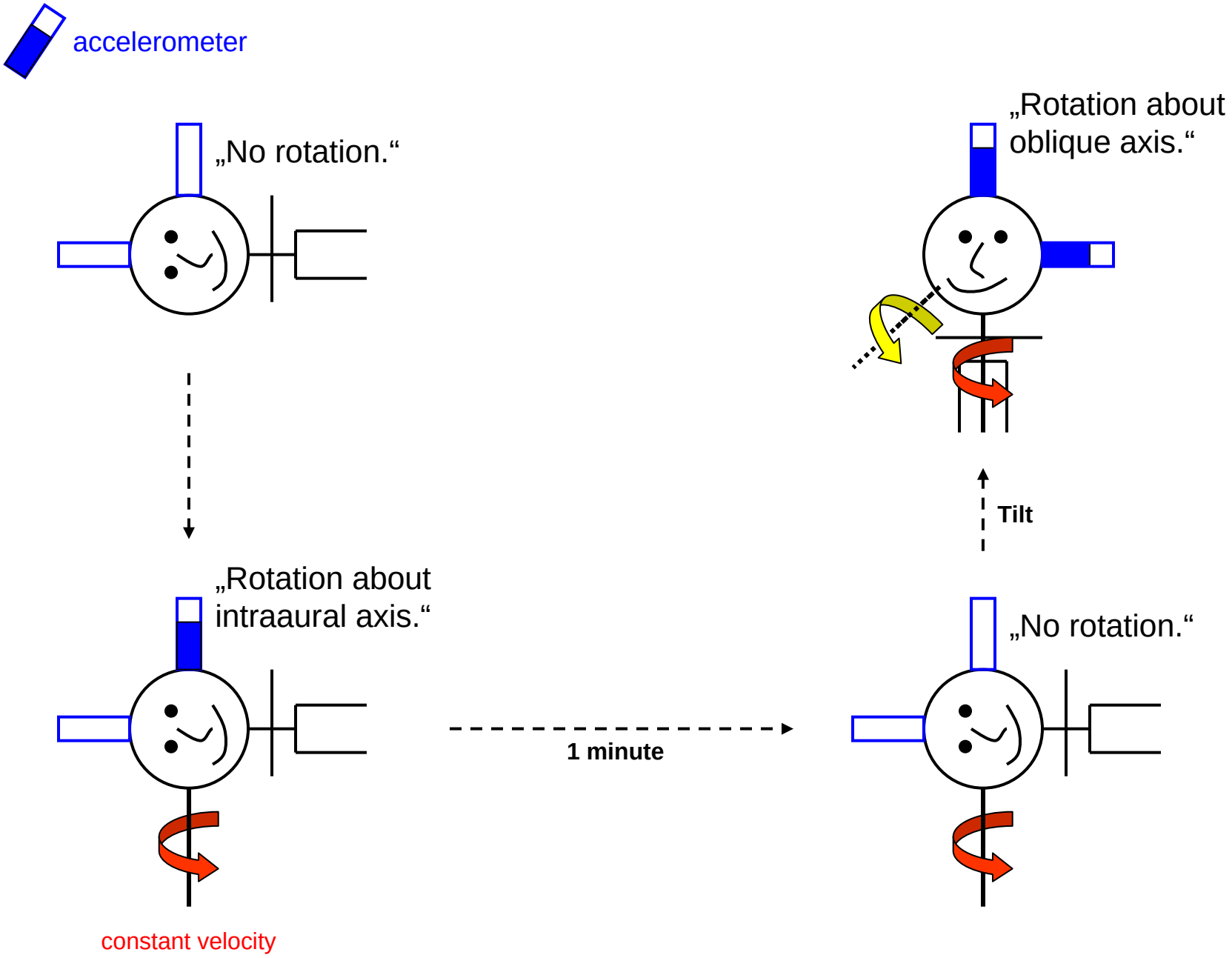

kontinuierliche
Drehung um
vertikale Achse

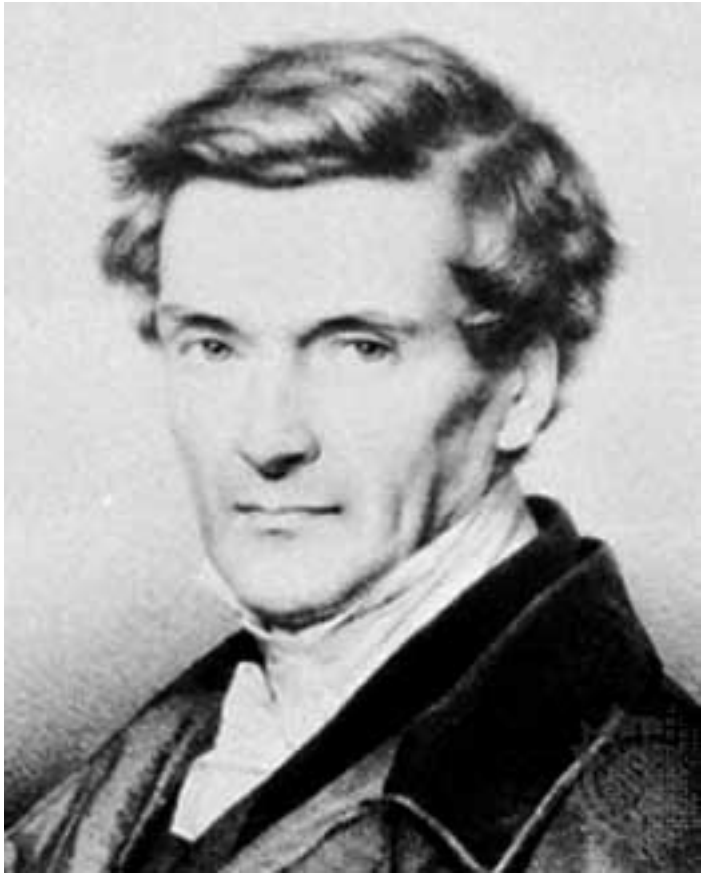


Coriolis-Experiment



Bockisch et al. 2003

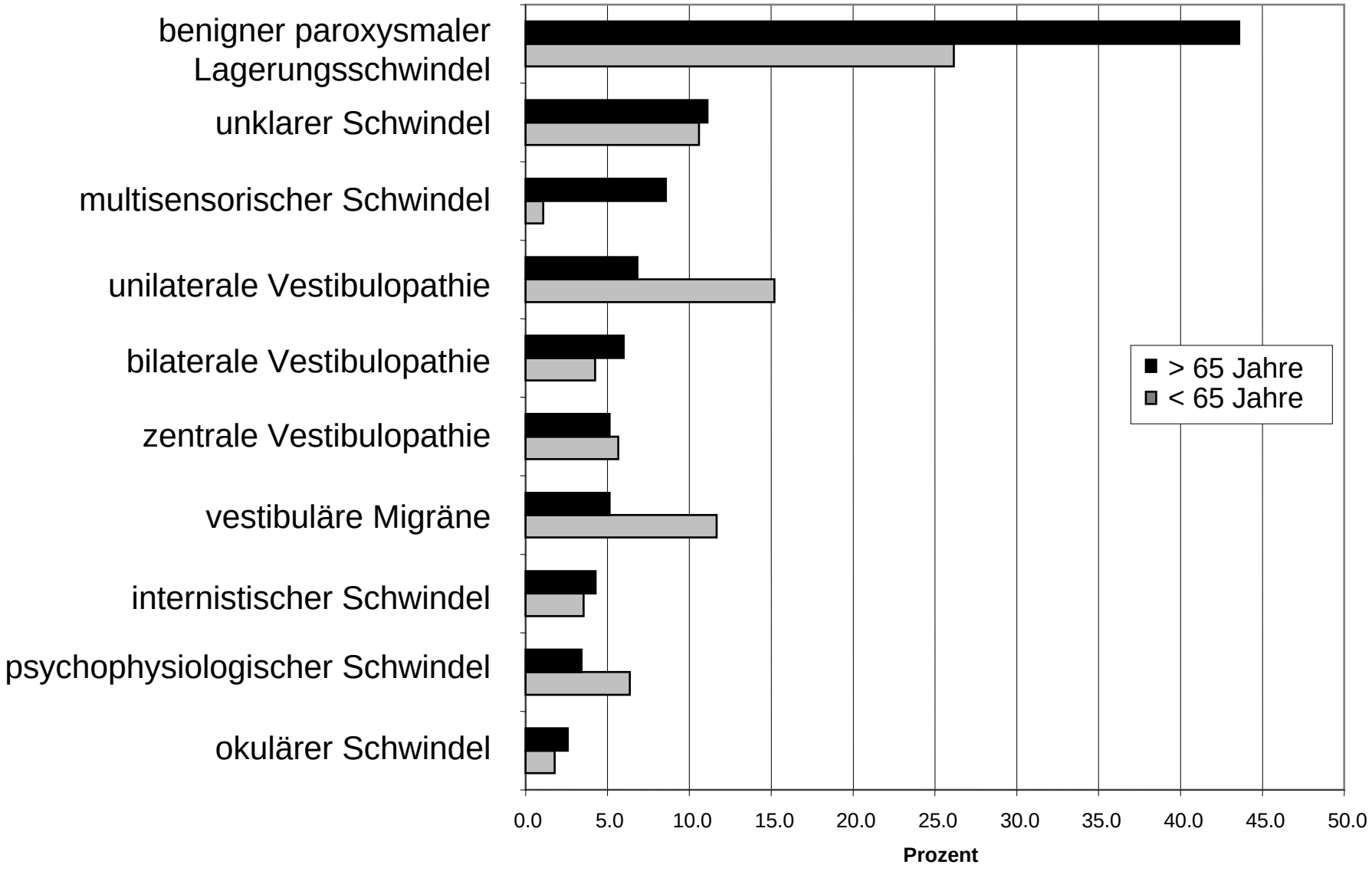

accelerometer
„No rotation.“
„Rotation about oblique axis.“
Tilt
„Rotation about intraaural axis.“
„No rotation.“
1 minute
constant velocity



Gaspard-Gustave de Coriolis
(Paris, 1792-1843)

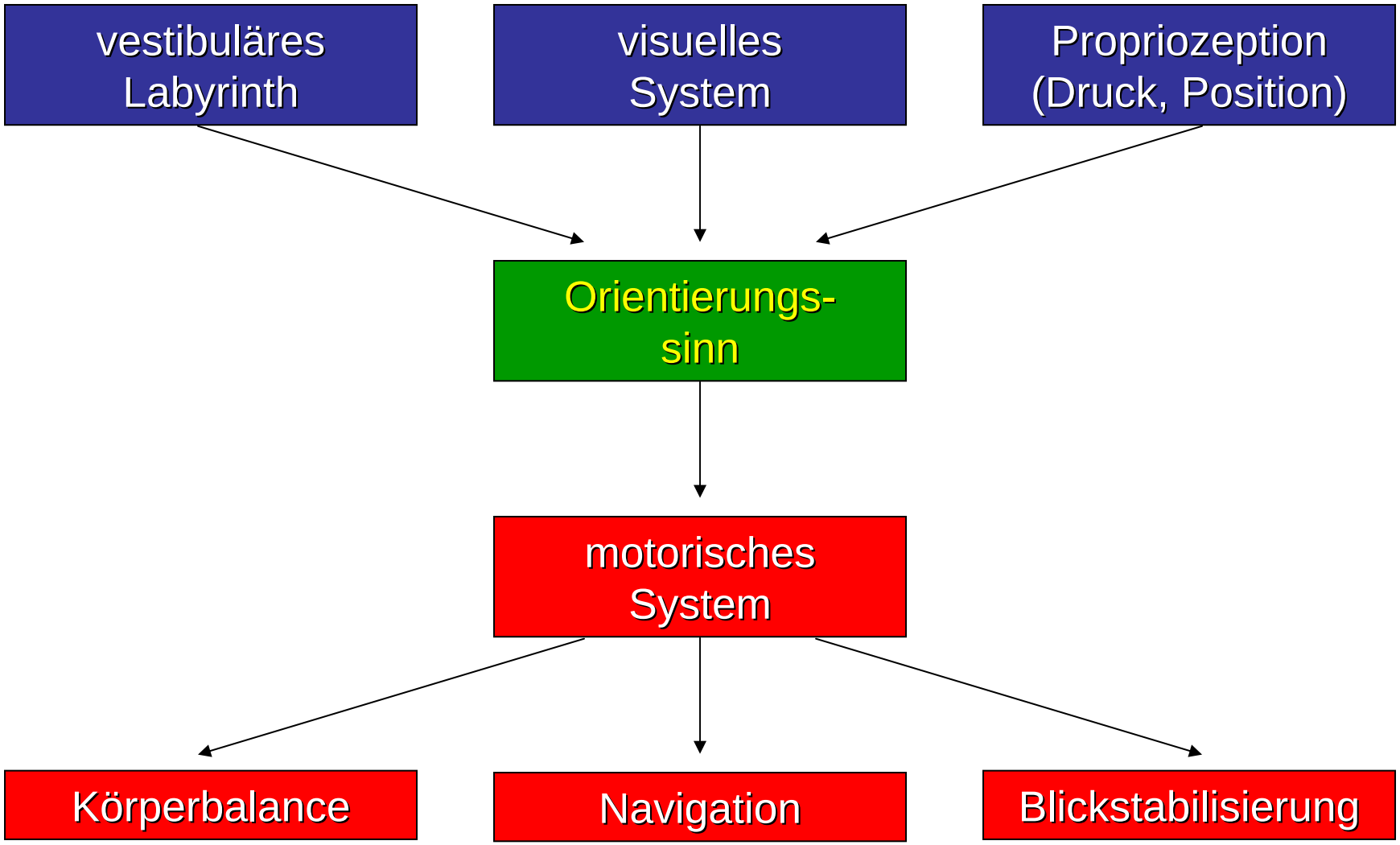
Syd Mead

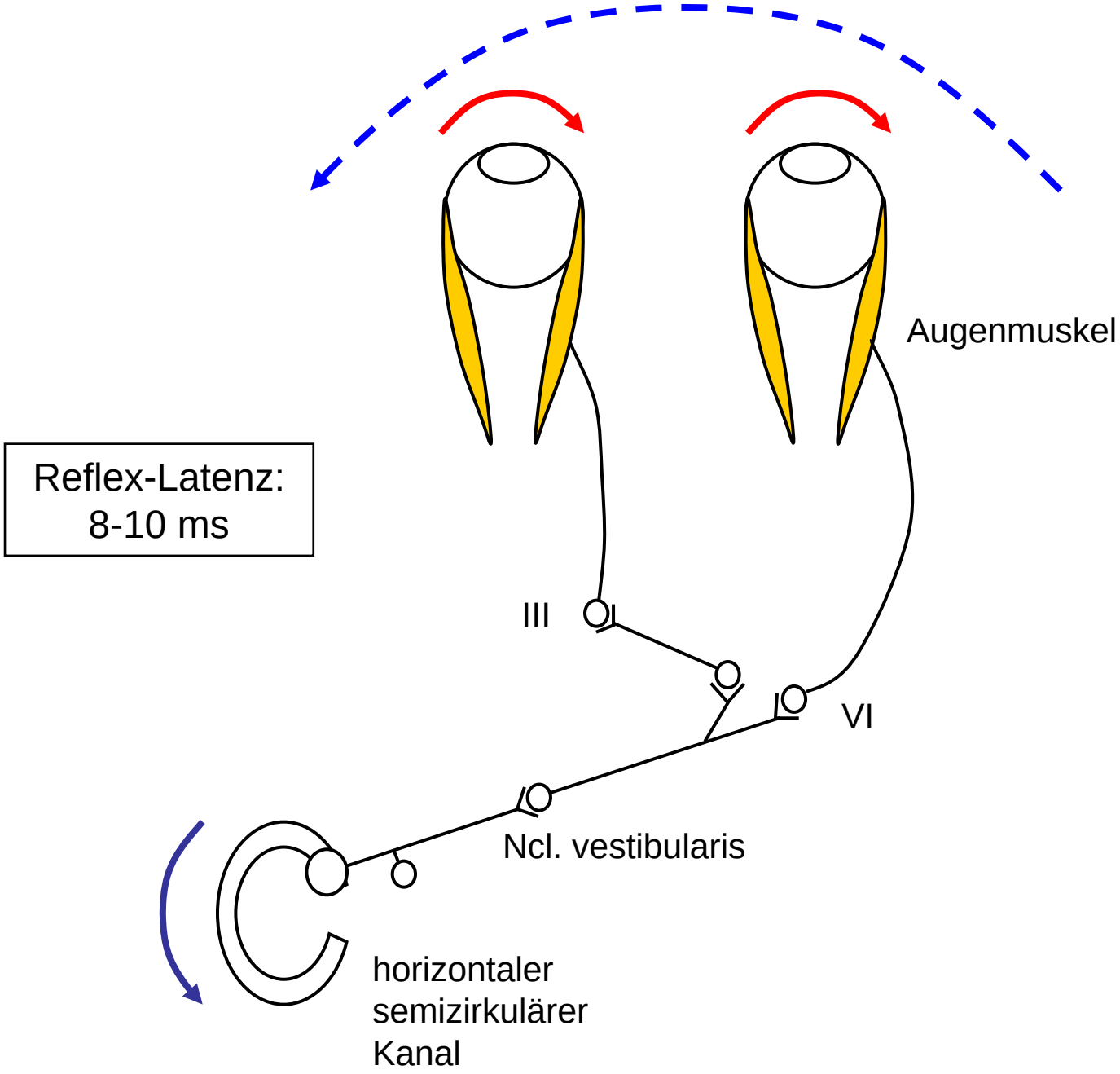
häufigste Schwindeldiagnosen

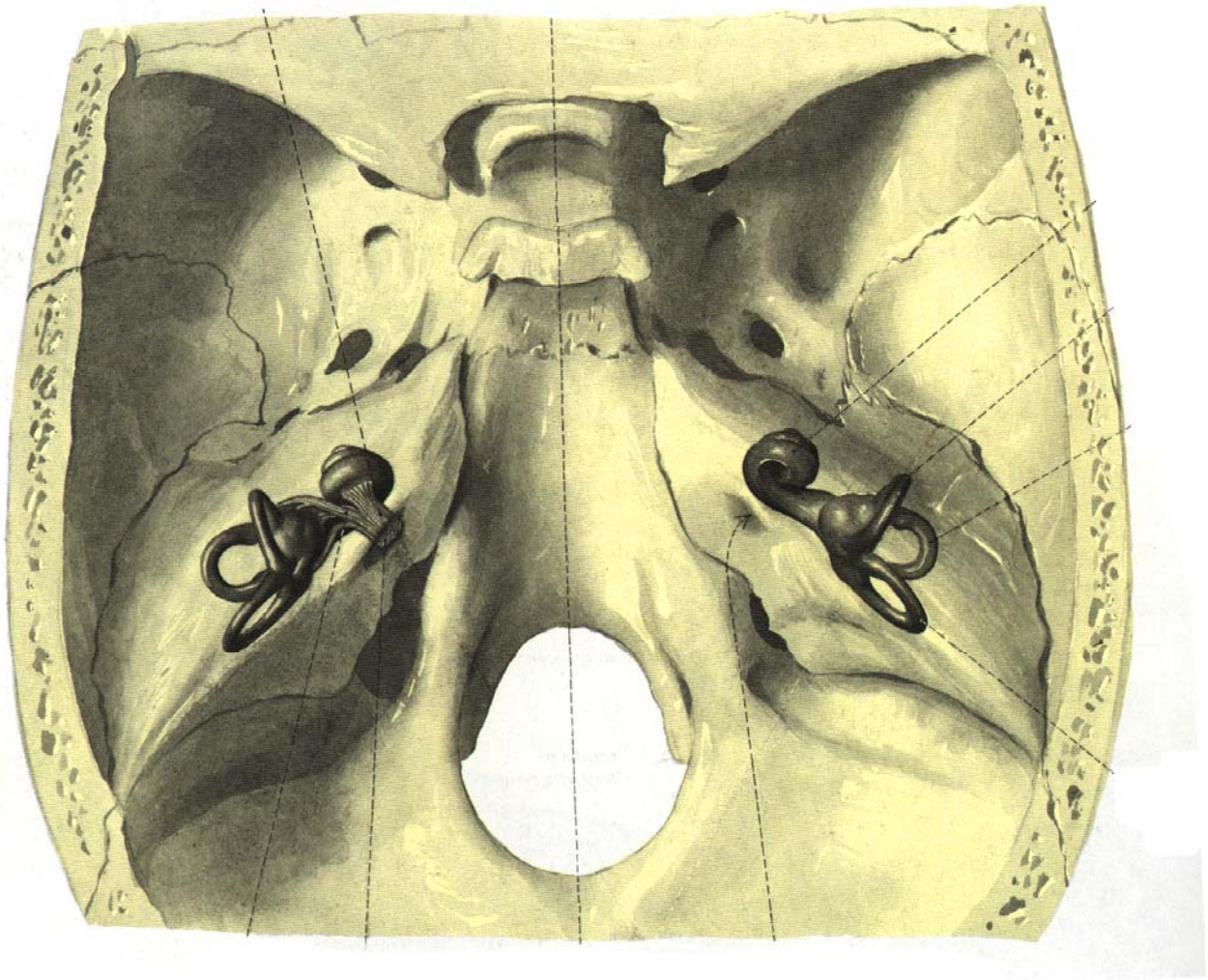


Orientierungssinn

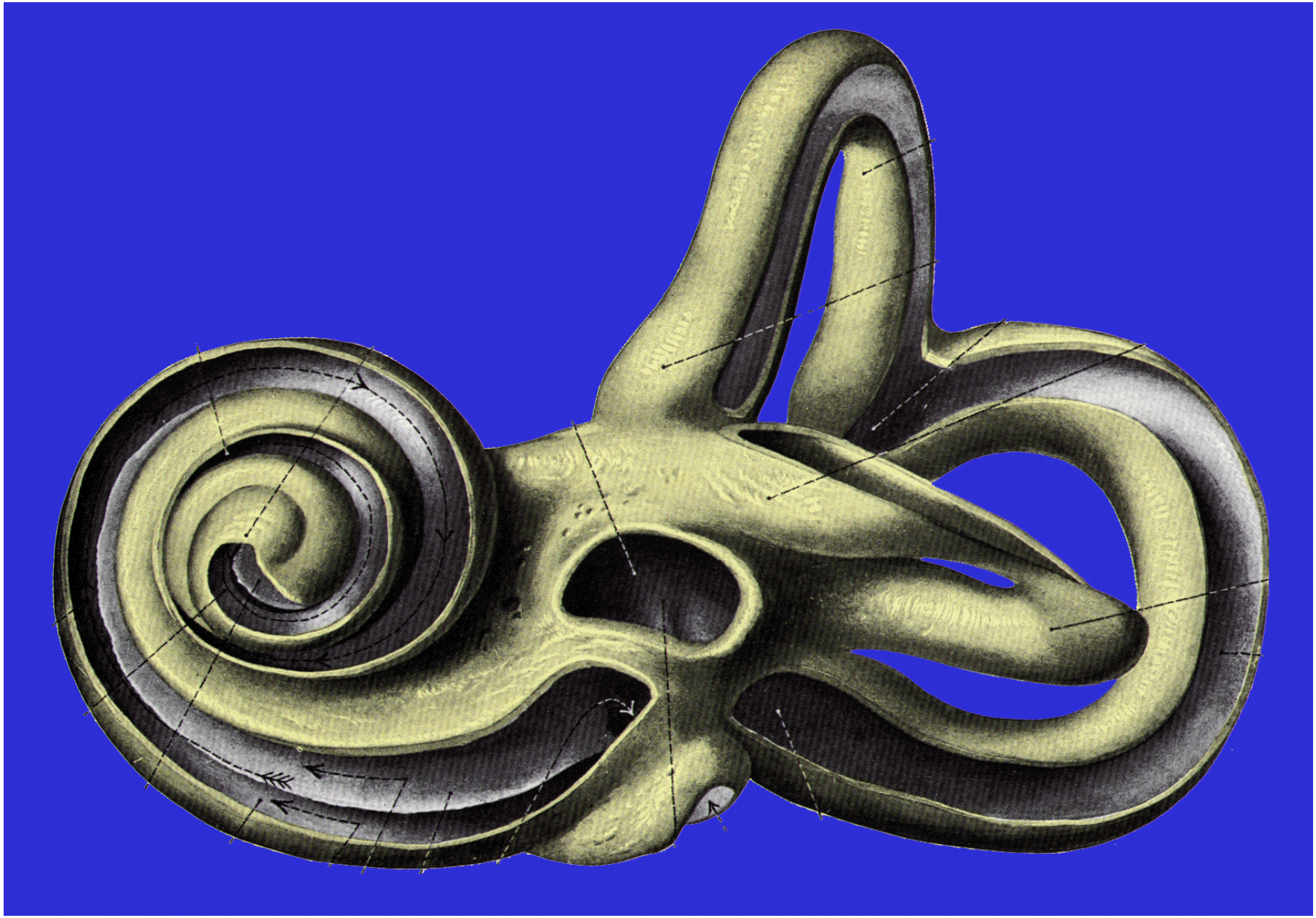
- In welche Richtung bewege ich mich?
- Um welche Achse drehe ich mich?
- Wie stehe / sitze / liege ich zur Schwerkraft?


vestibuläres Labyrinth
visuelles System
Propriozeption (Druck, Position)
Orientierungs-sinn
motorisches System
Körperbalance
Navigation
Blickstabilisierung

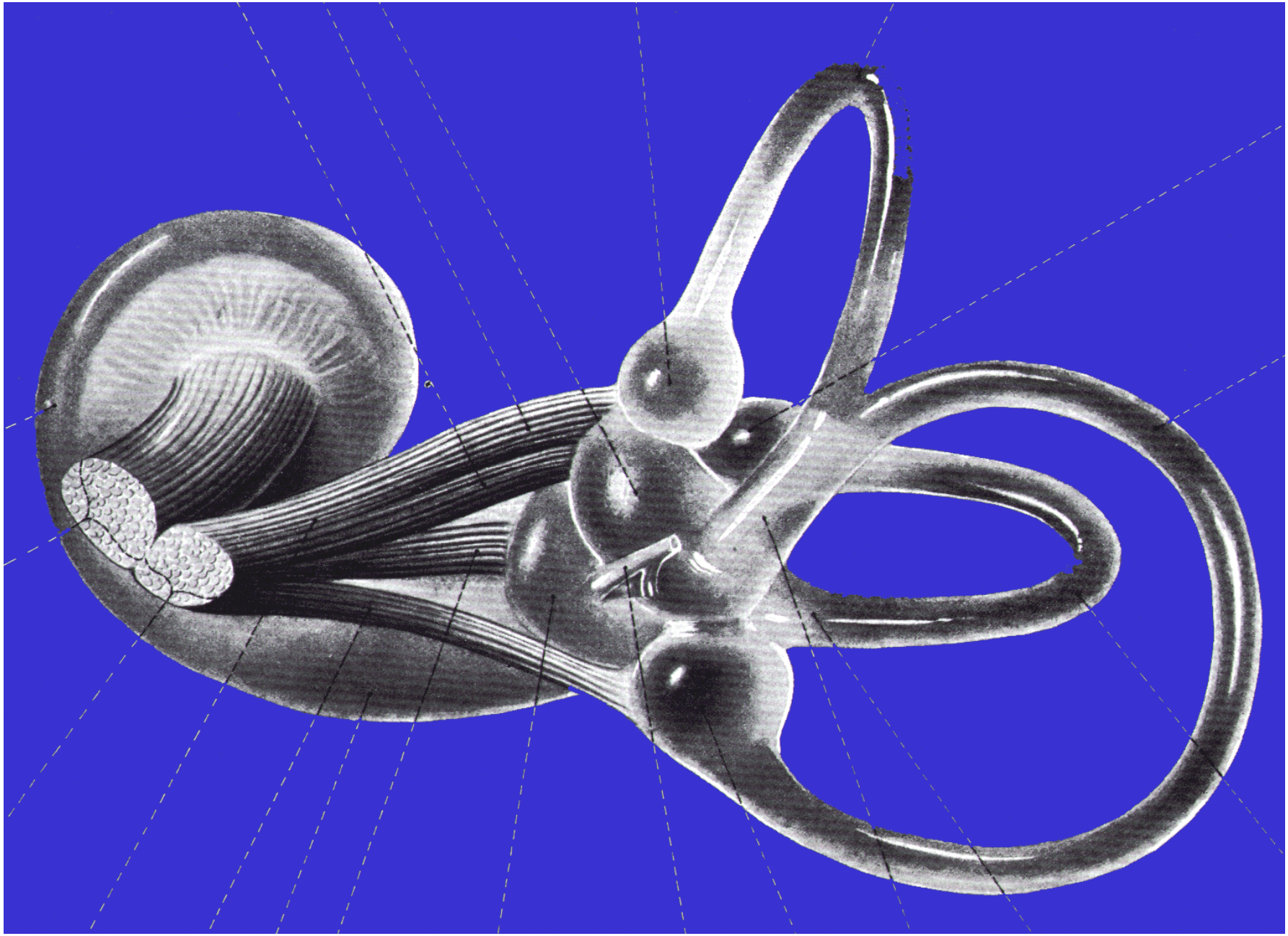

Augenmuskel
Reflex-Latenz:
8-10 ms
III
VI
Ncl. vestibularis
horizontaler
semizirkulärer
Kanal



Ferner &
Staubesand 1982

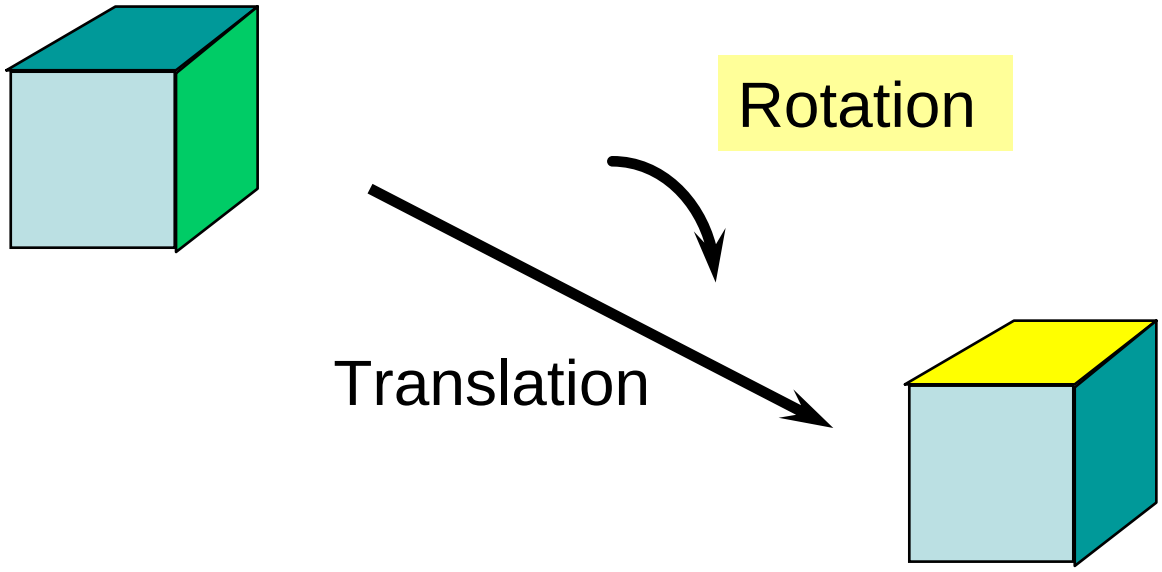


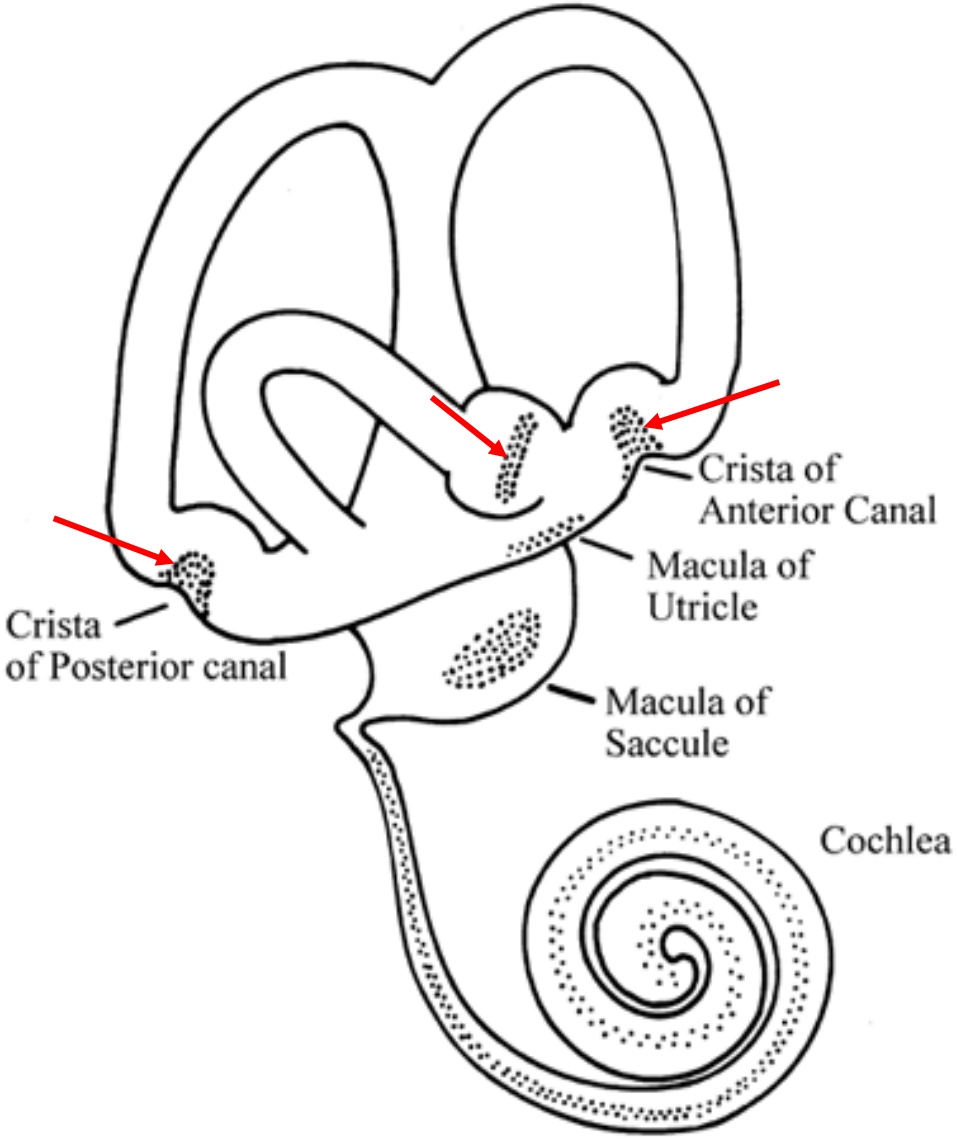
Ferner und
Staubesand 1982



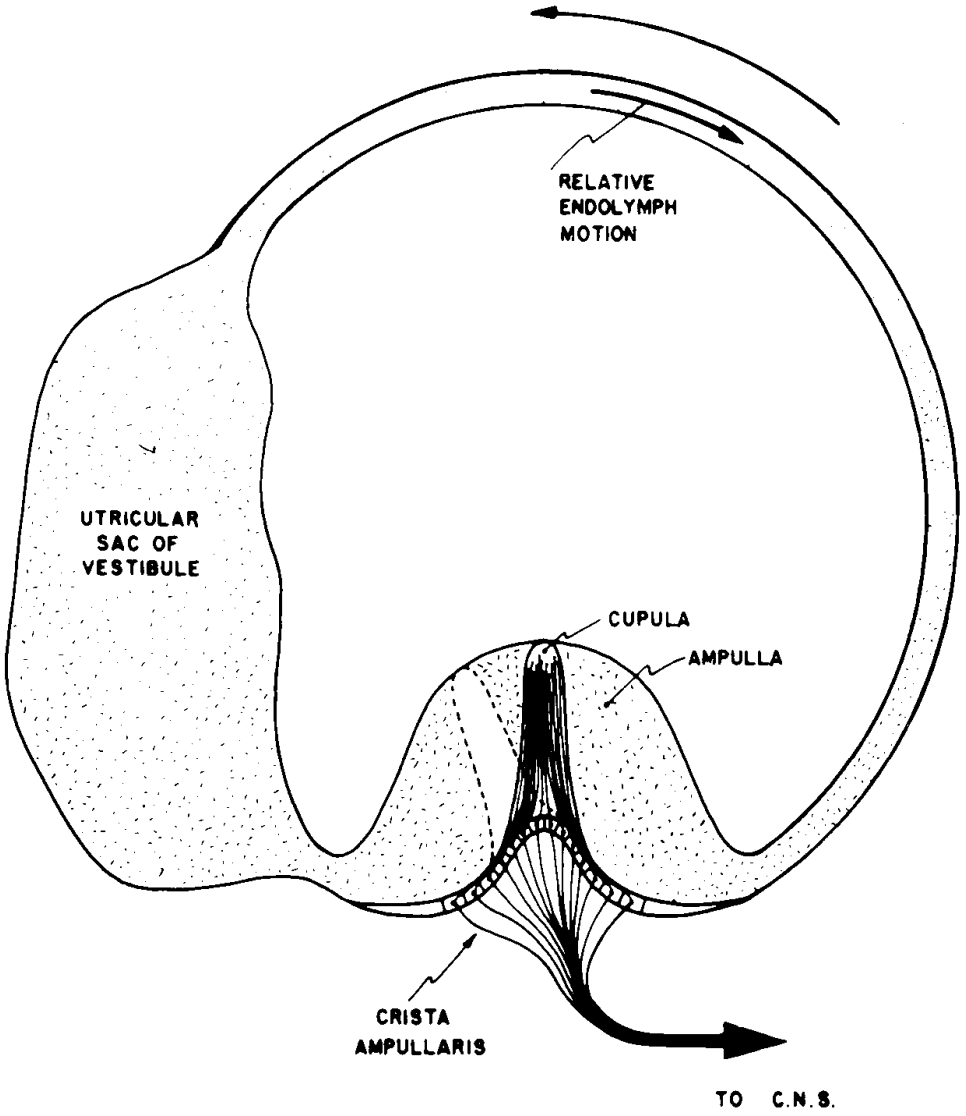
Ferner und
Staubesand 1982

Bewegung

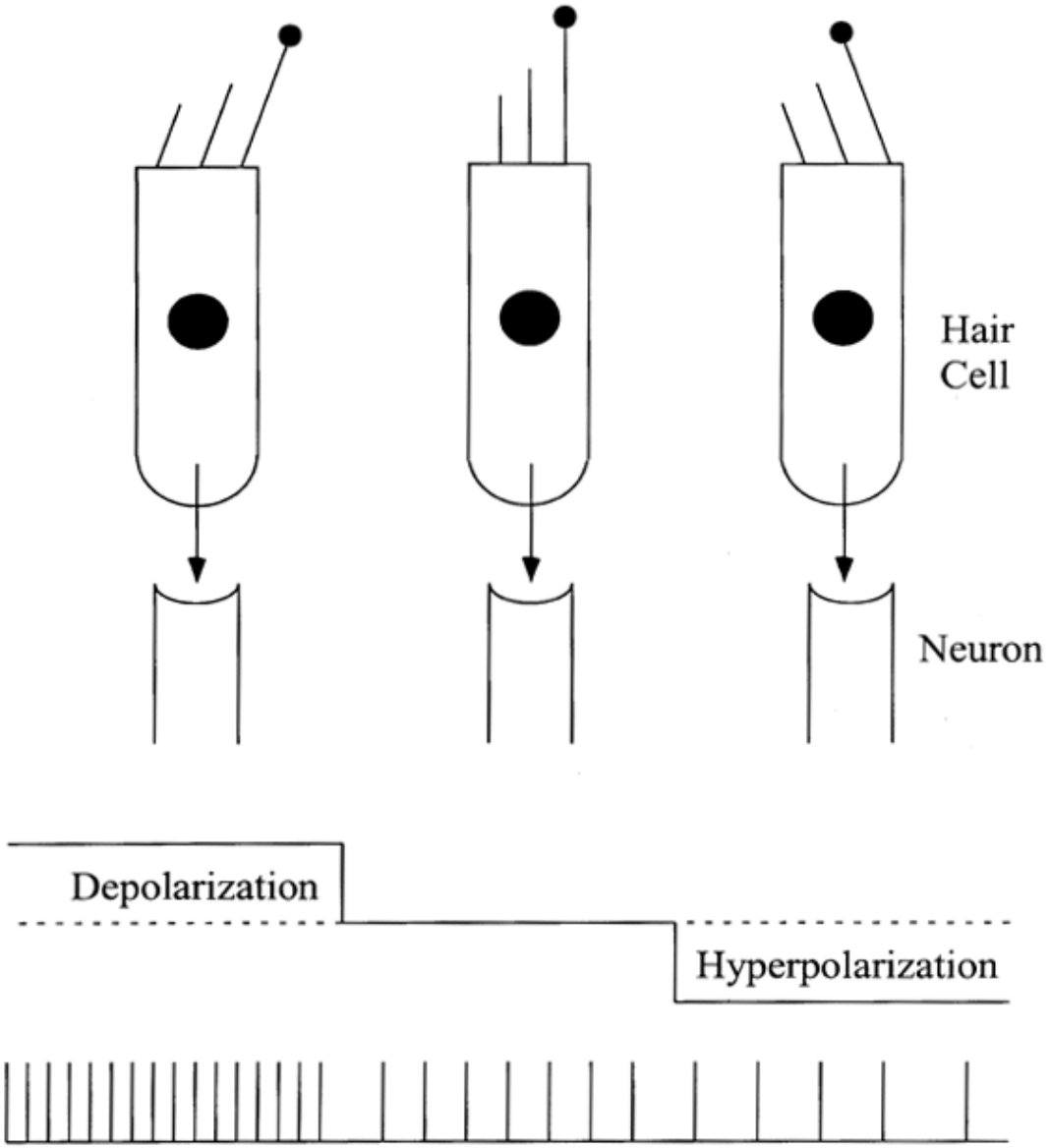




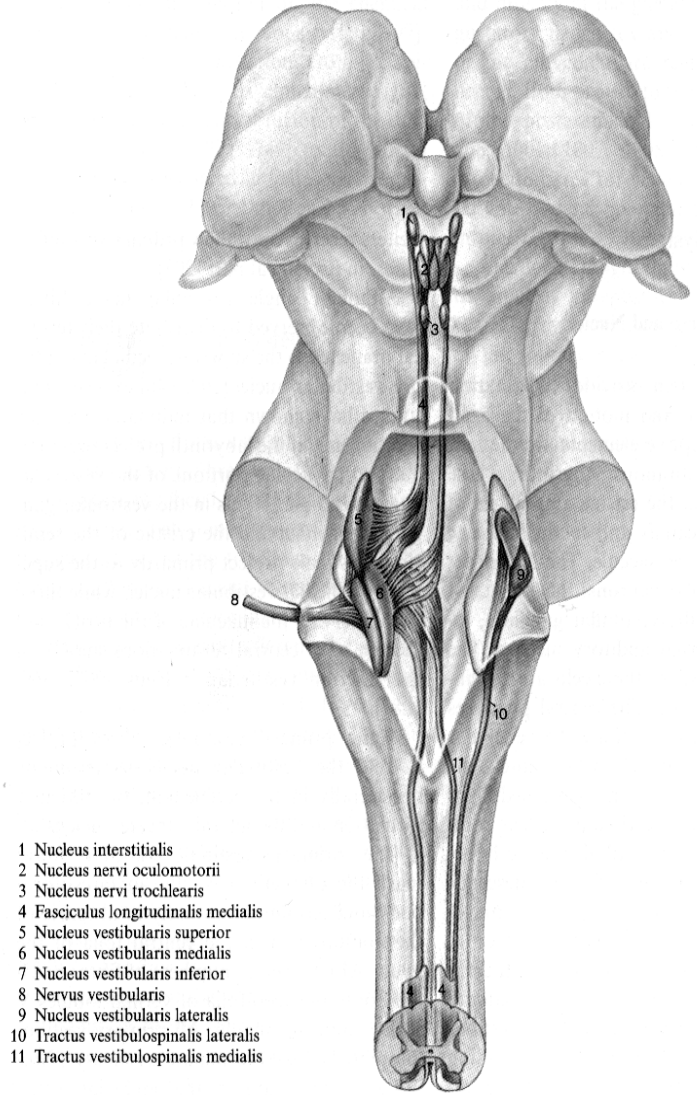
Leigh &
Zee 1999



Baloh &
Honrubia 1990



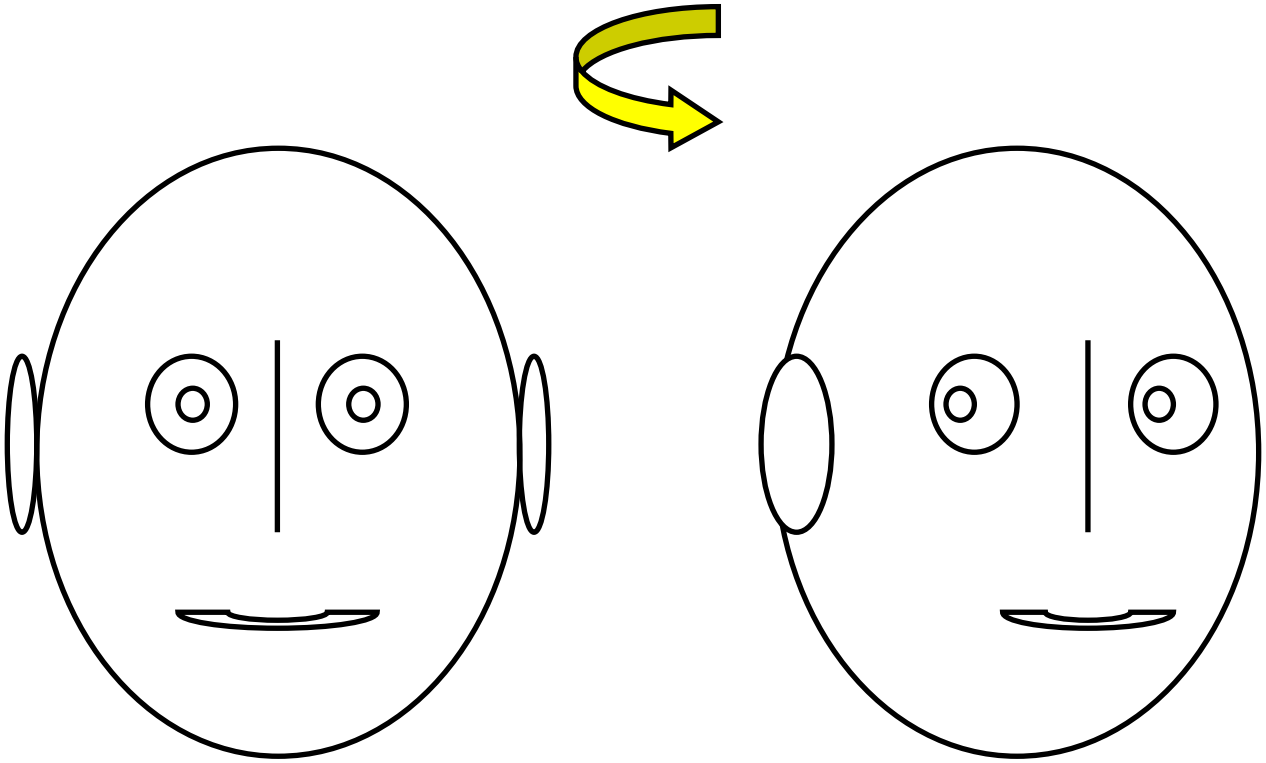
Leigh &
Zee 1999



1 Nucleus interstitialis
2 Nucleus nervi oculomotorii
3 Nucleus nervi trochlearis
4 Fasciculus longitudinalis medialis
5 Nucleus vestibularis superior
6 Nucleus vestibularis medialis
7 Nucleus vestibularis inferior
8 Nervus vestibularis
9 Nucleus vestibularis lateralis
10 Tractus vestibulospinalis lateralis
11 Tractus vestibulospinalis medialis

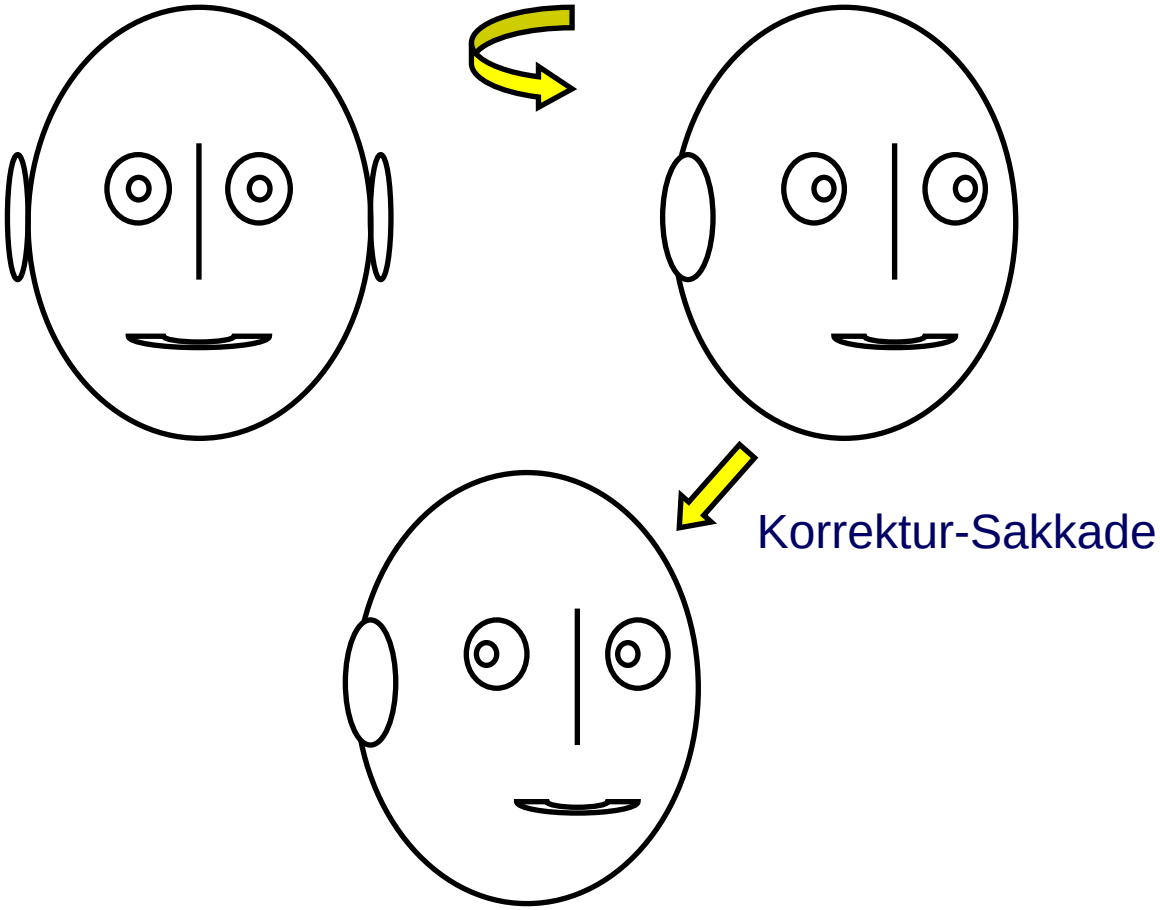
R. Nieuwenhuys et al. 1988

Normaler Kopf-Impuls-Test*



*Halmagyi G.M., Curthoys I.S (1988)
Archives of Neurology

Pathologischer Kopf-Impuls-Test

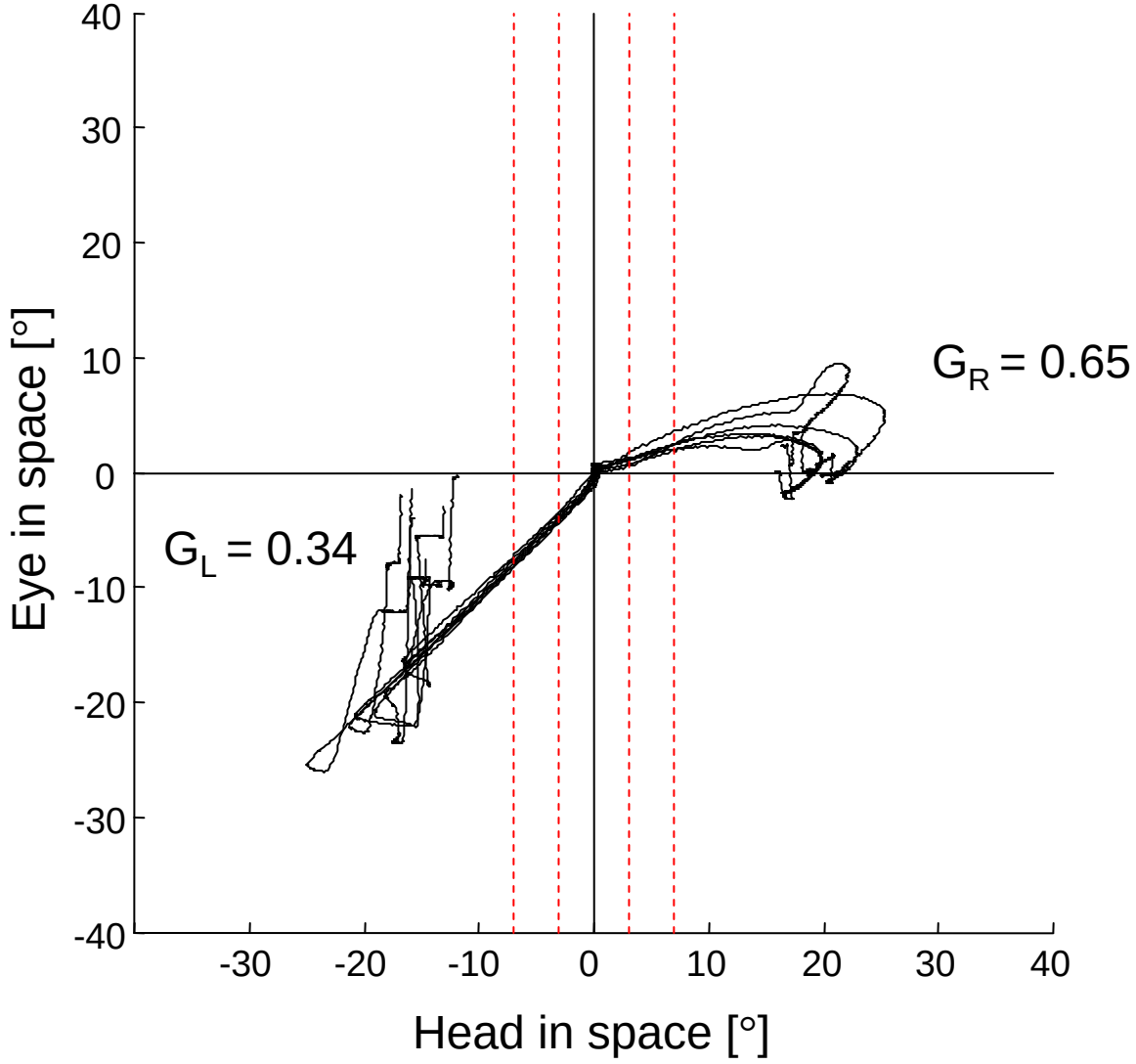


asymmetrisch bilaterale oder rechtsseitige Läsion?

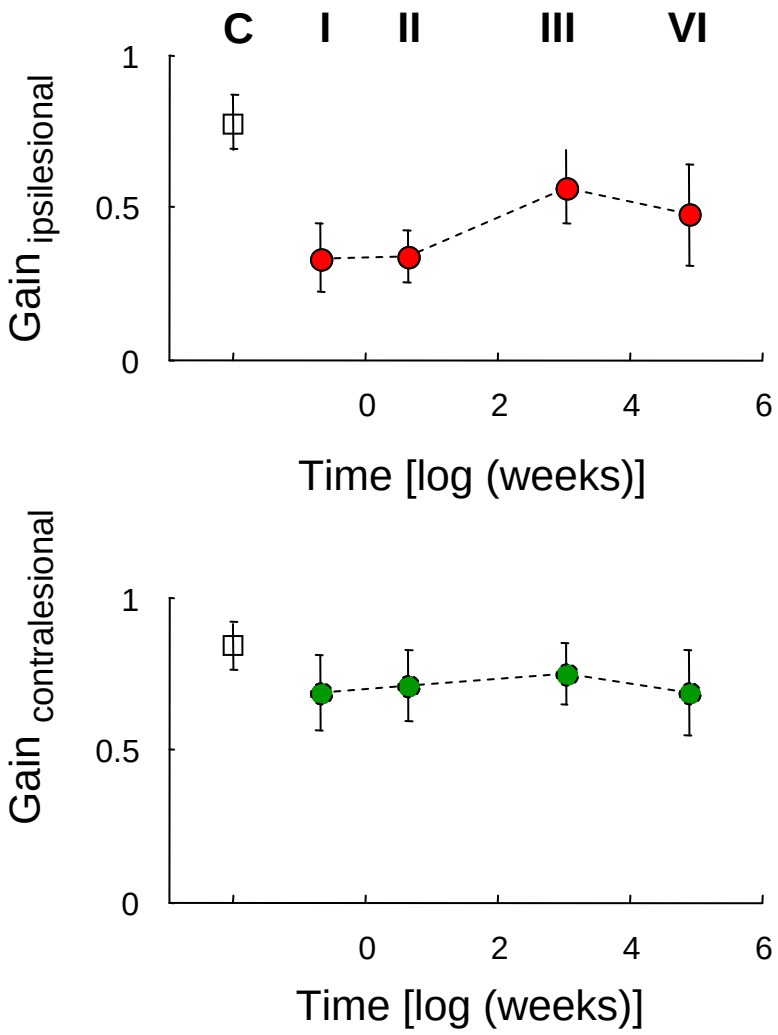
Video

Beeinflusst ein einseitiger vestibulärer Ausfall den VOR auf die andere Seite?

5 Tage nach vestibulärer Neuritis



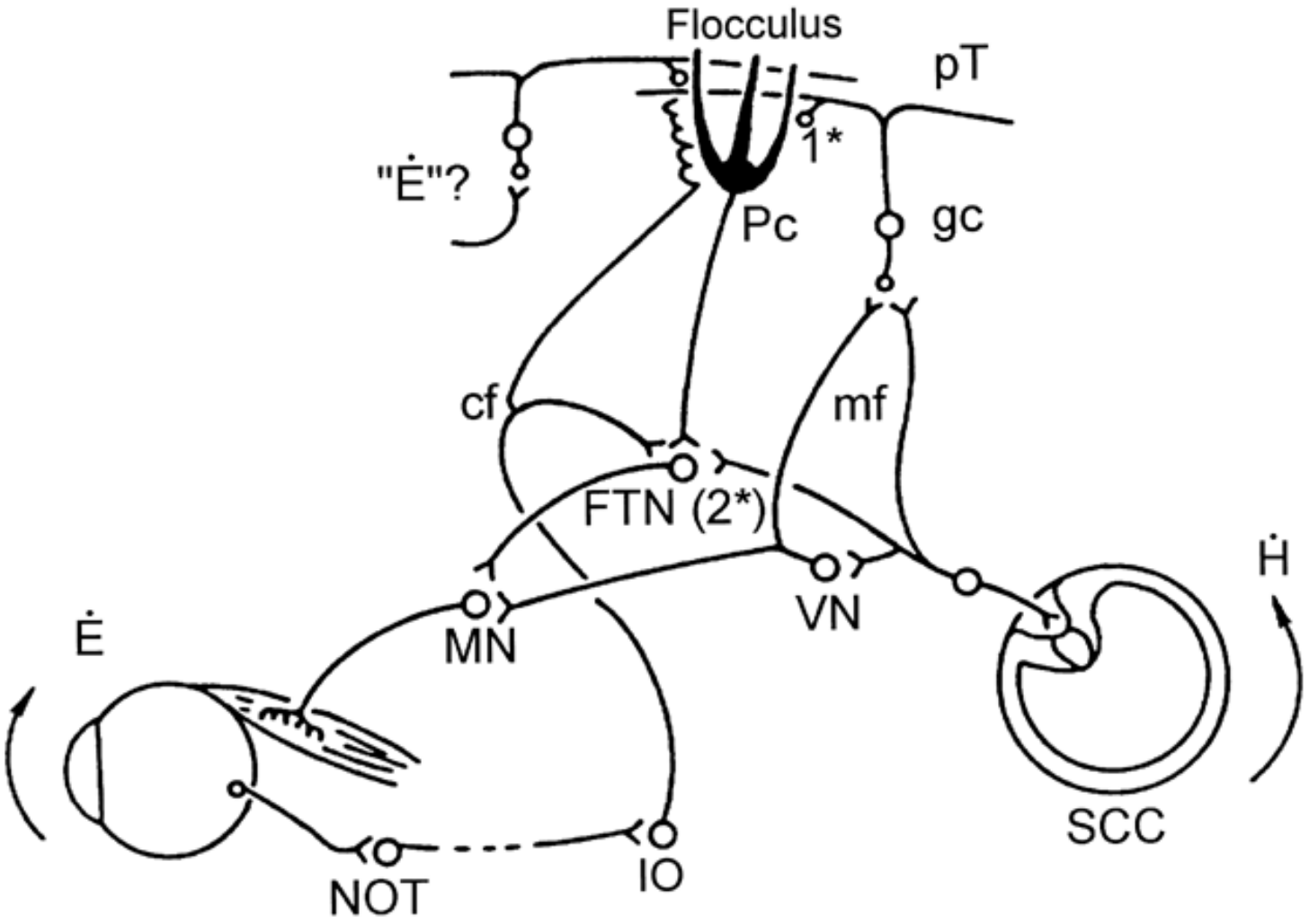
Vestibuläre Neuritis: Zeitverlauf



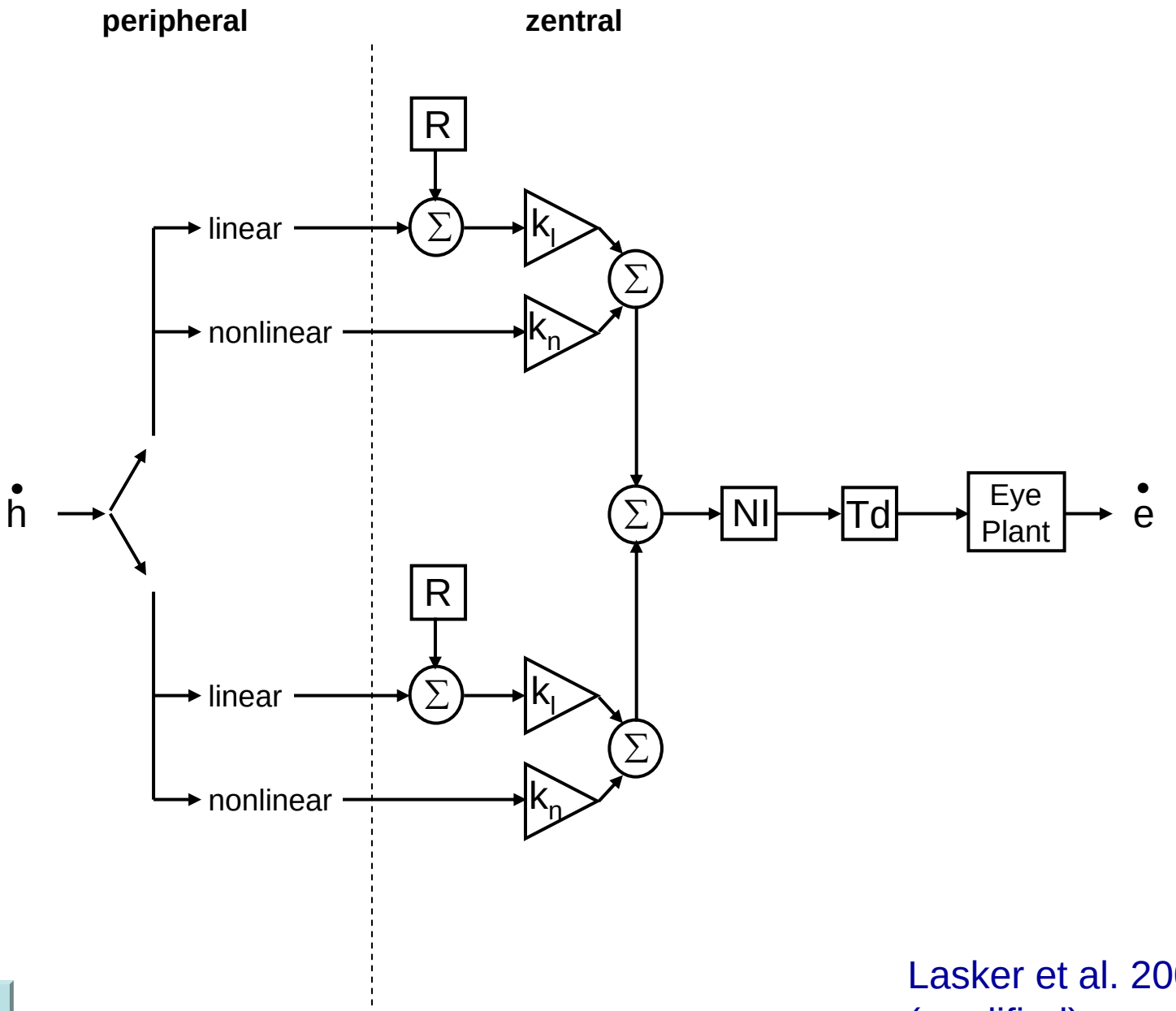
I-IV: patients

C: normals

Palla et al. (2005)

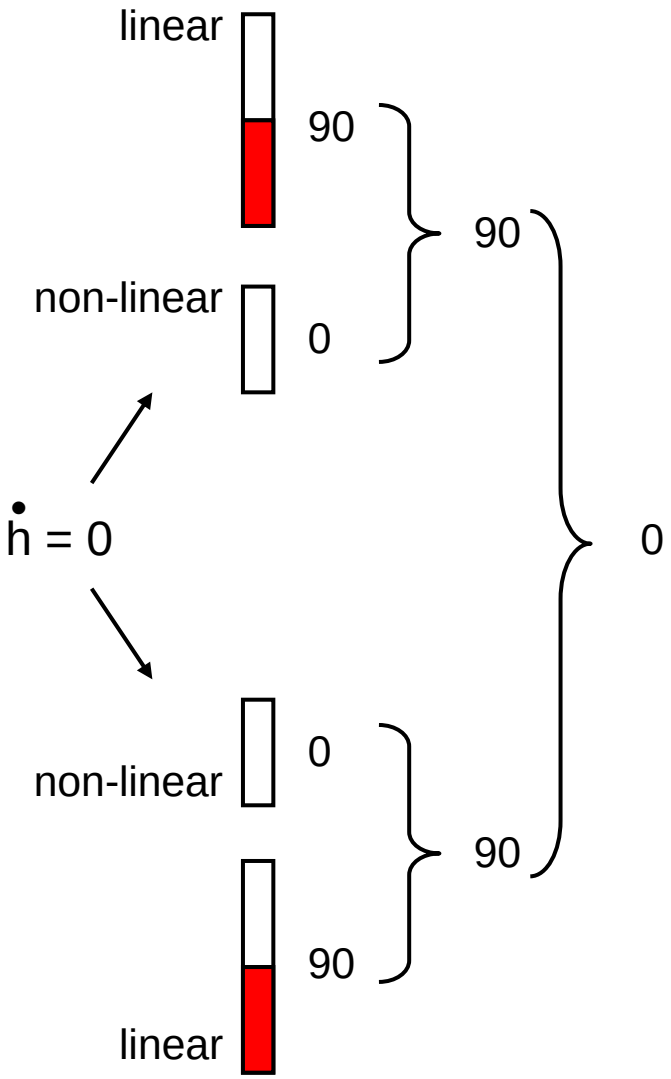


Leigh &
Zee 2006

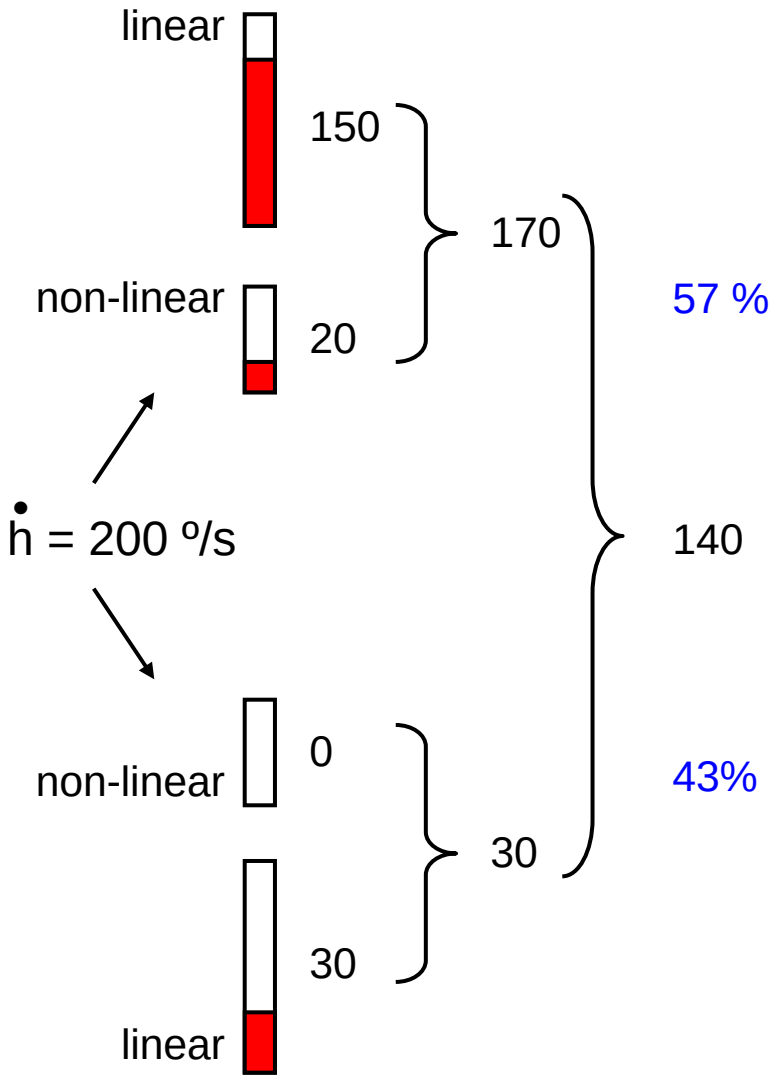


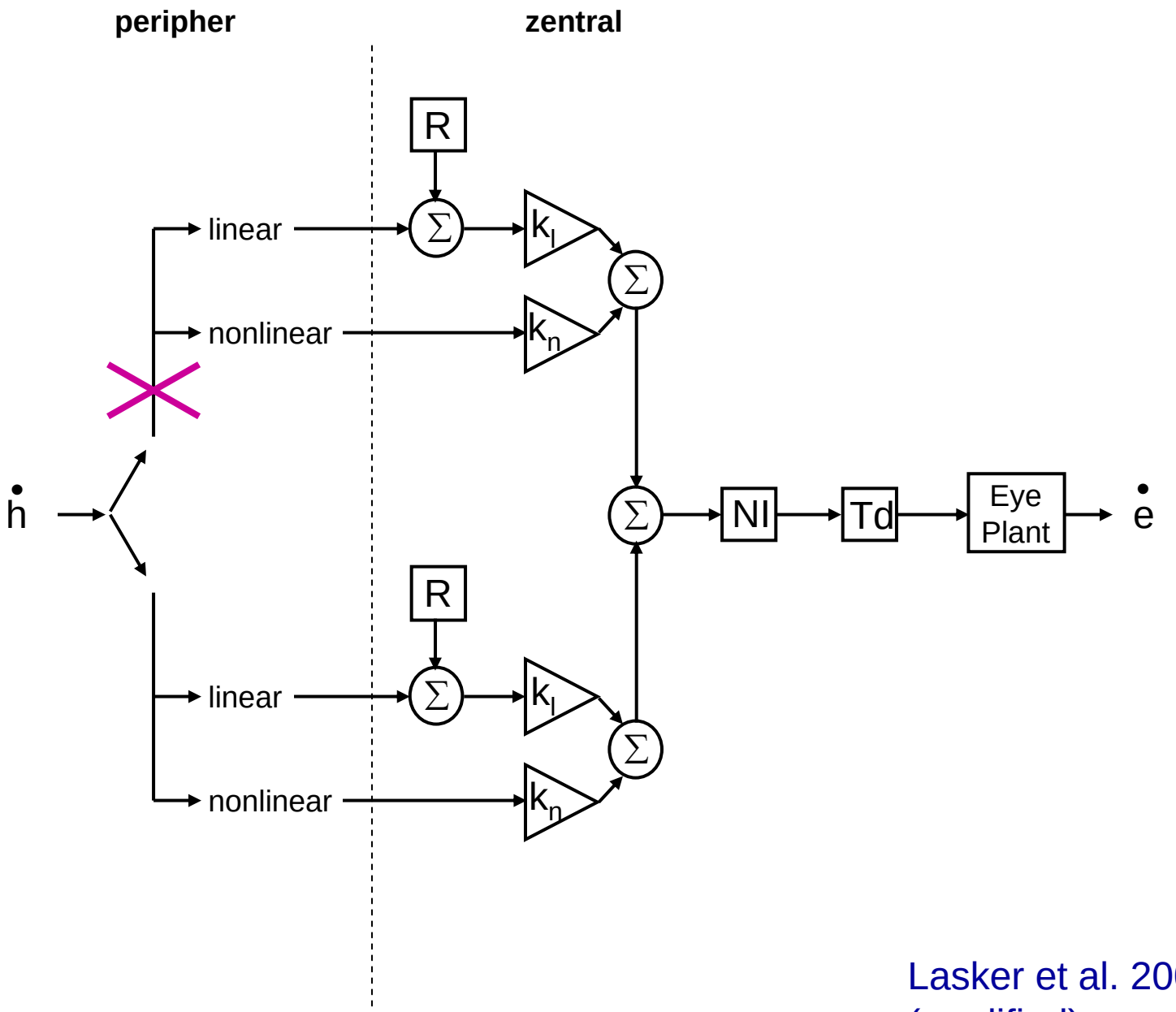
Lasker et al. 2000
(modified)

Head not moving



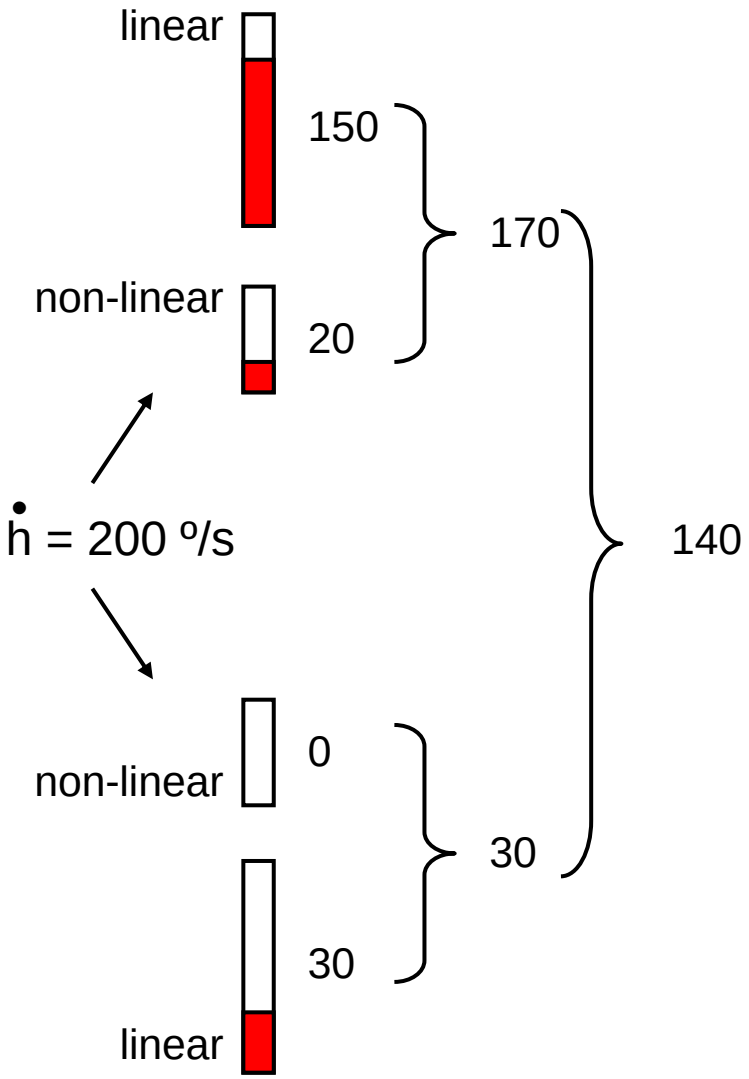
Head impulse to the right



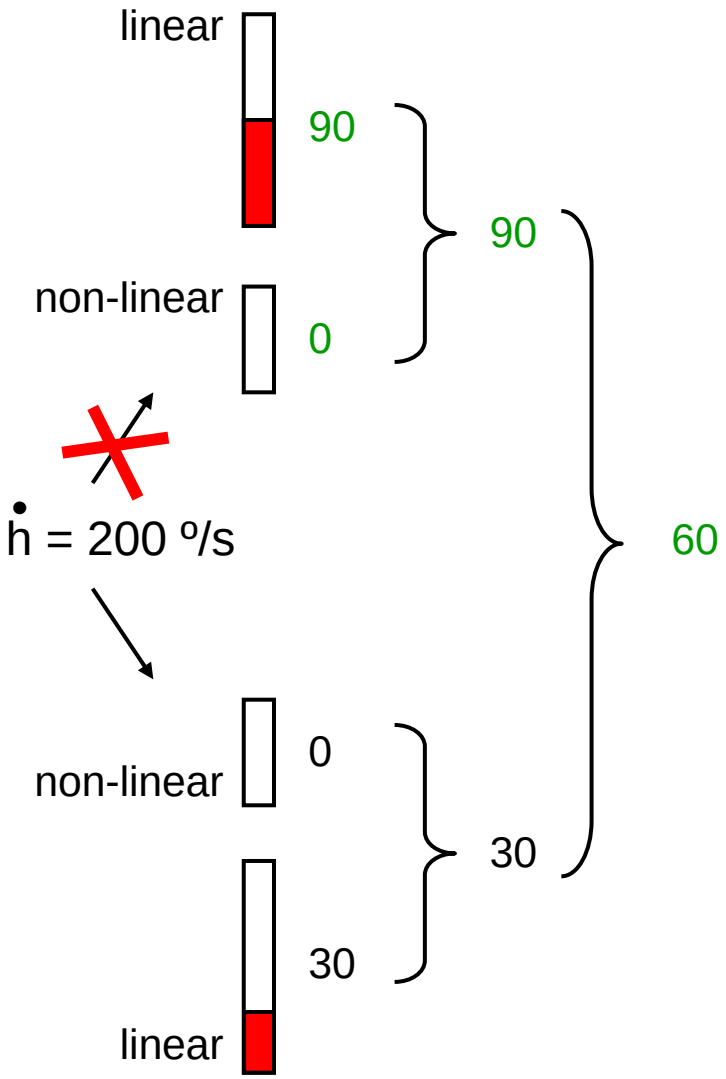


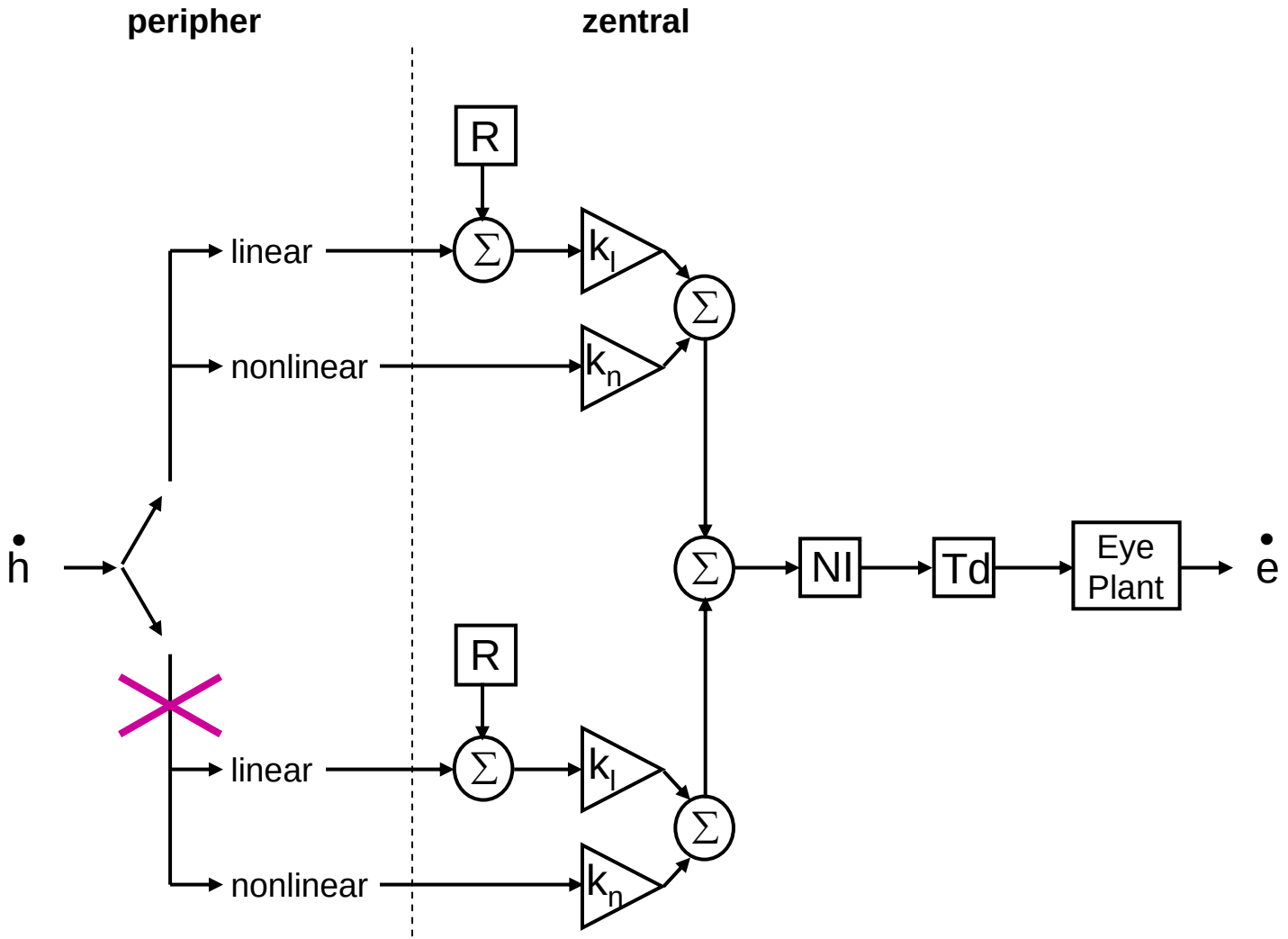
Lasker et al. 2000
(modified)

Head impulse to the right



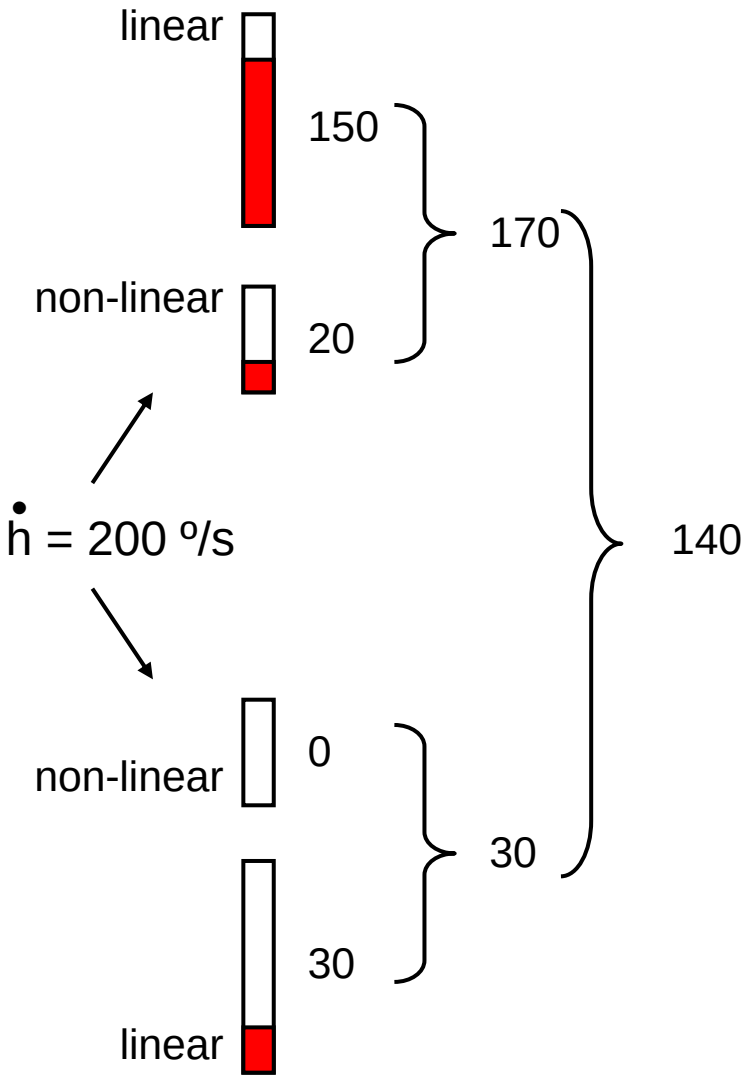
Head impulse to the right



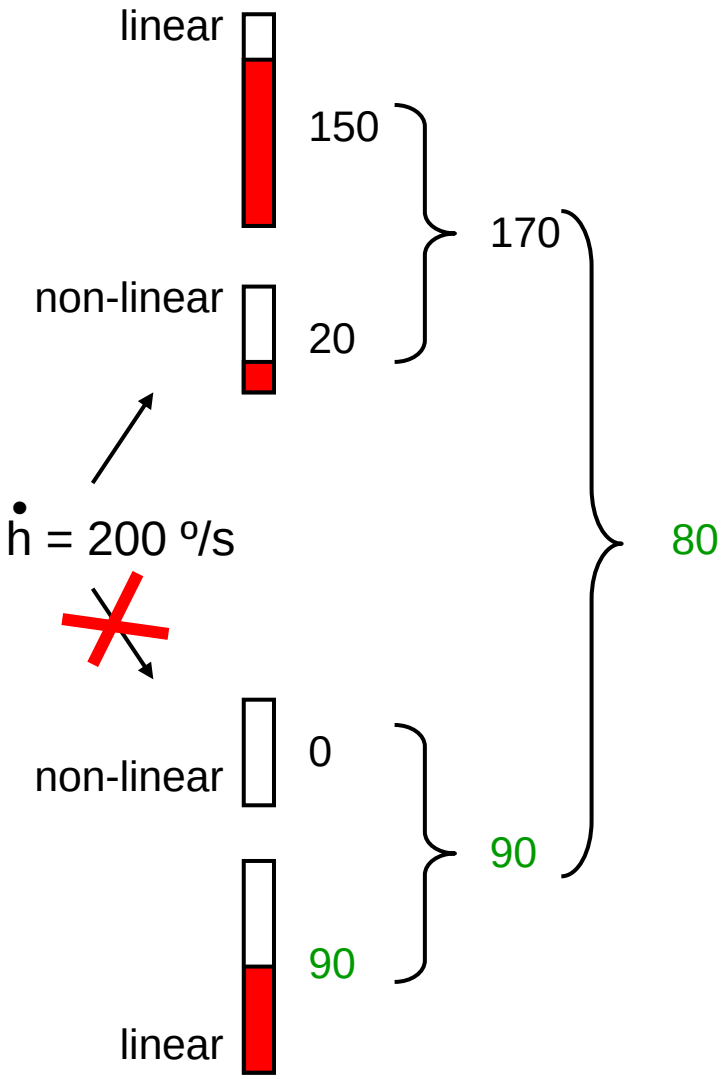


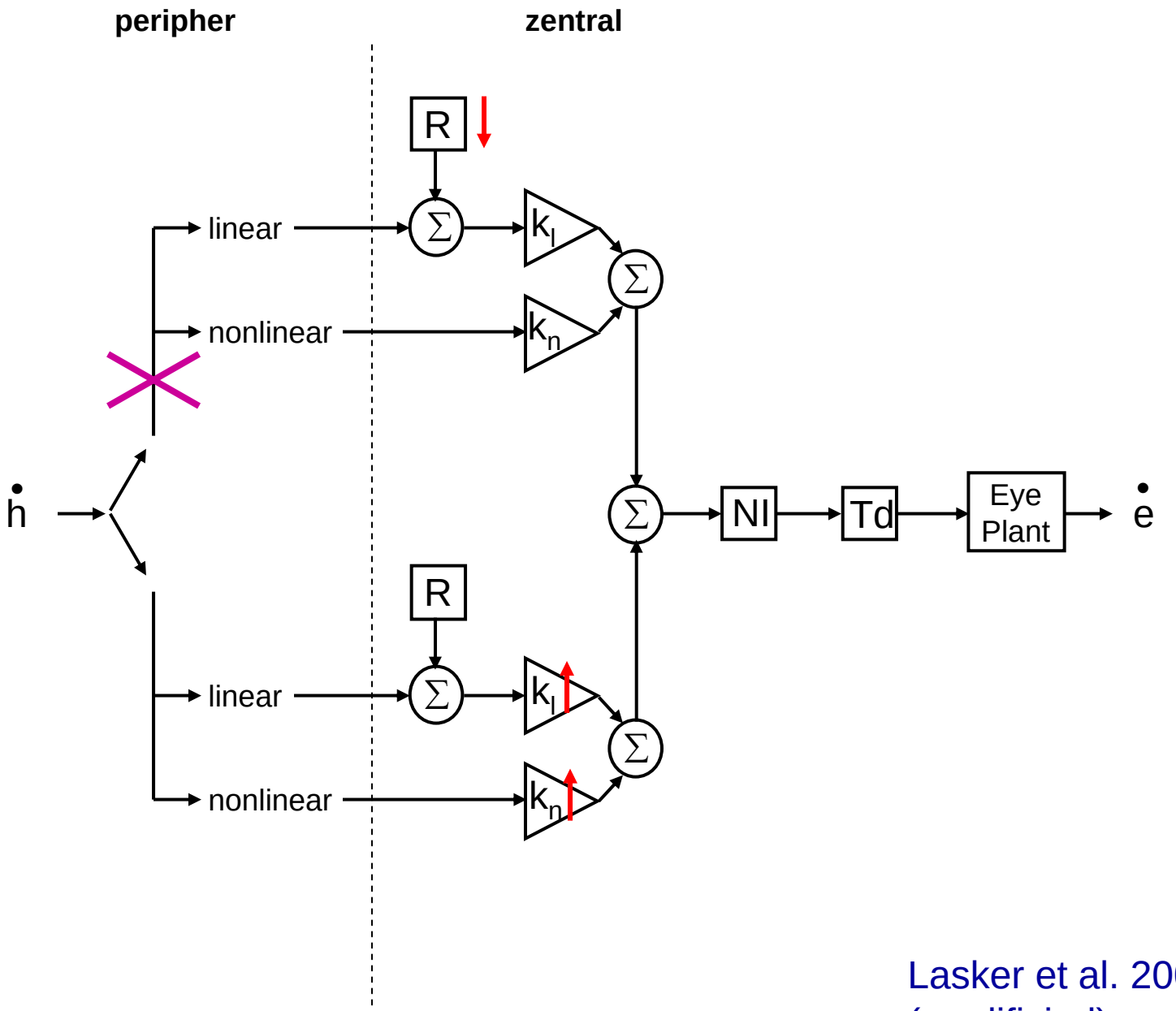
Lasker et al. 2000
(modified)

Head impulse to the right



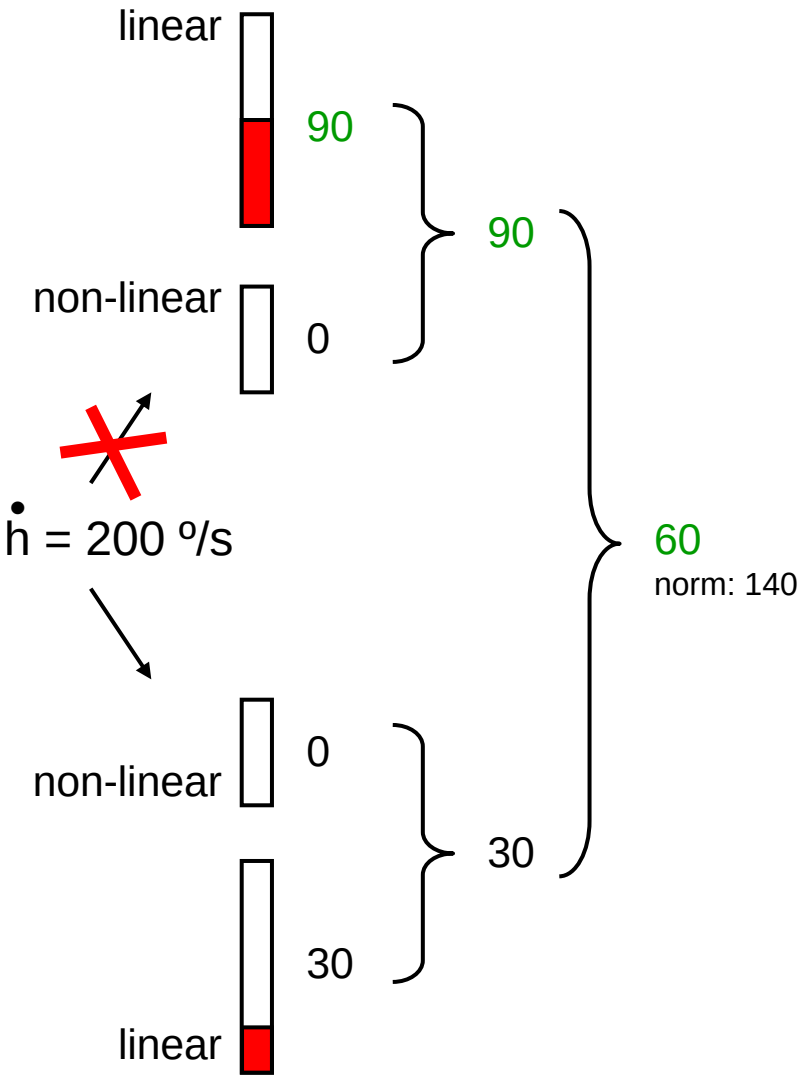
Head impulse to the right



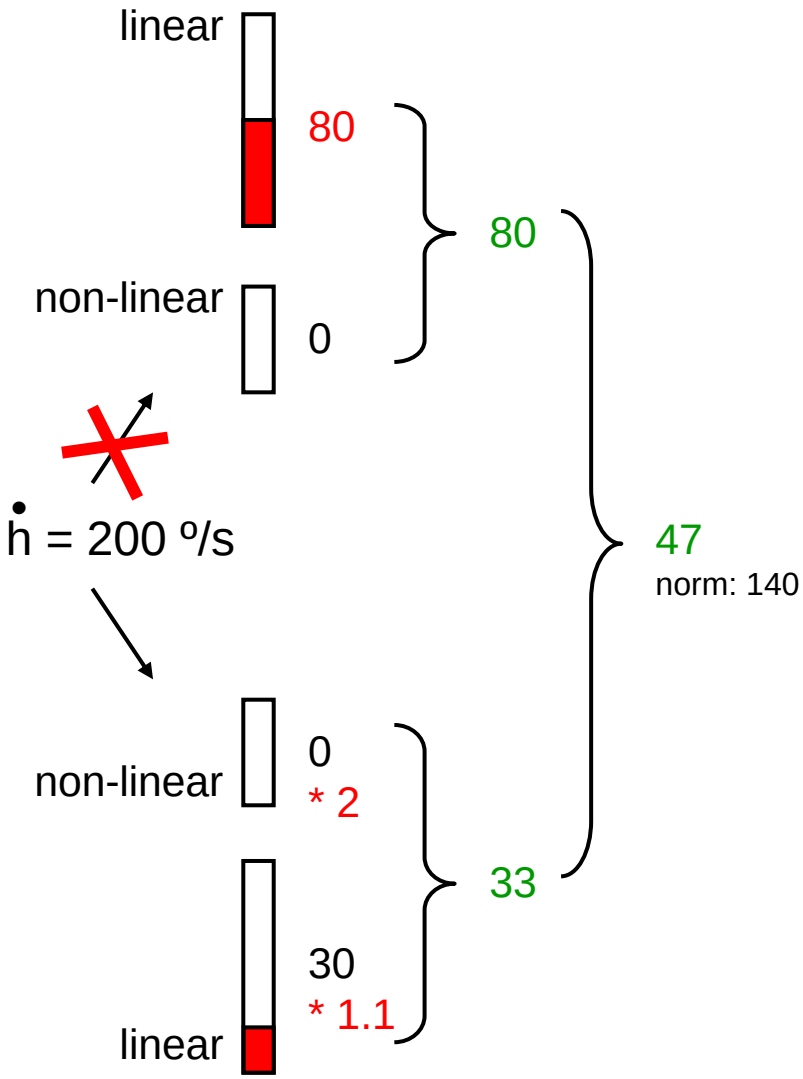


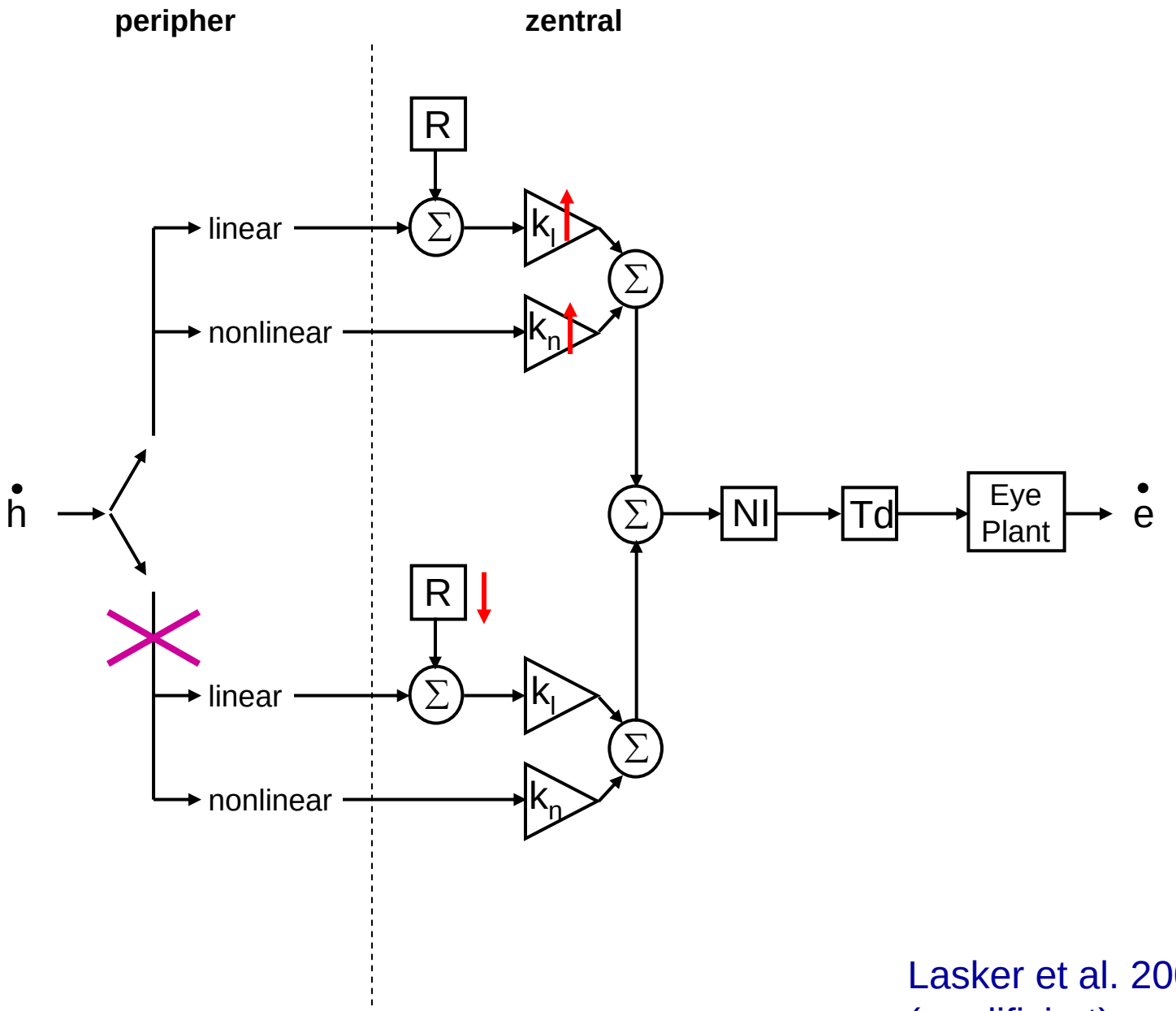
Lasker et al. 2000
(modifizied)

Head impulse to the right



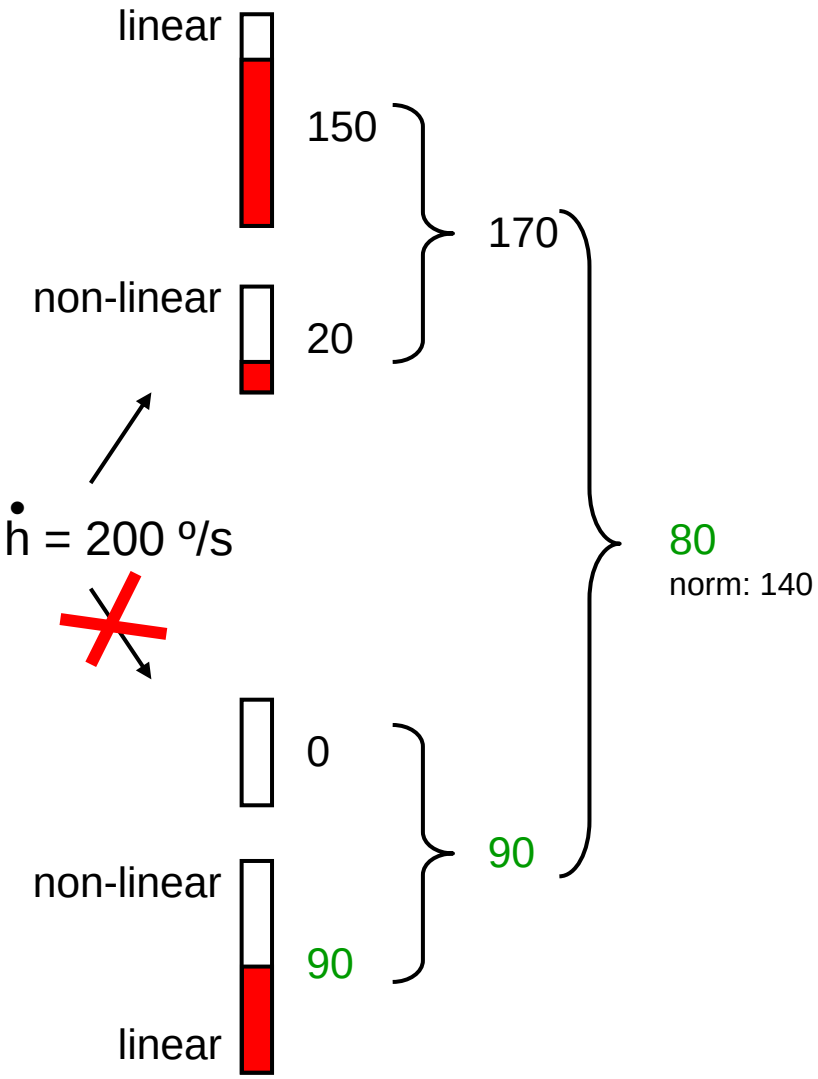
Head impulse to the right



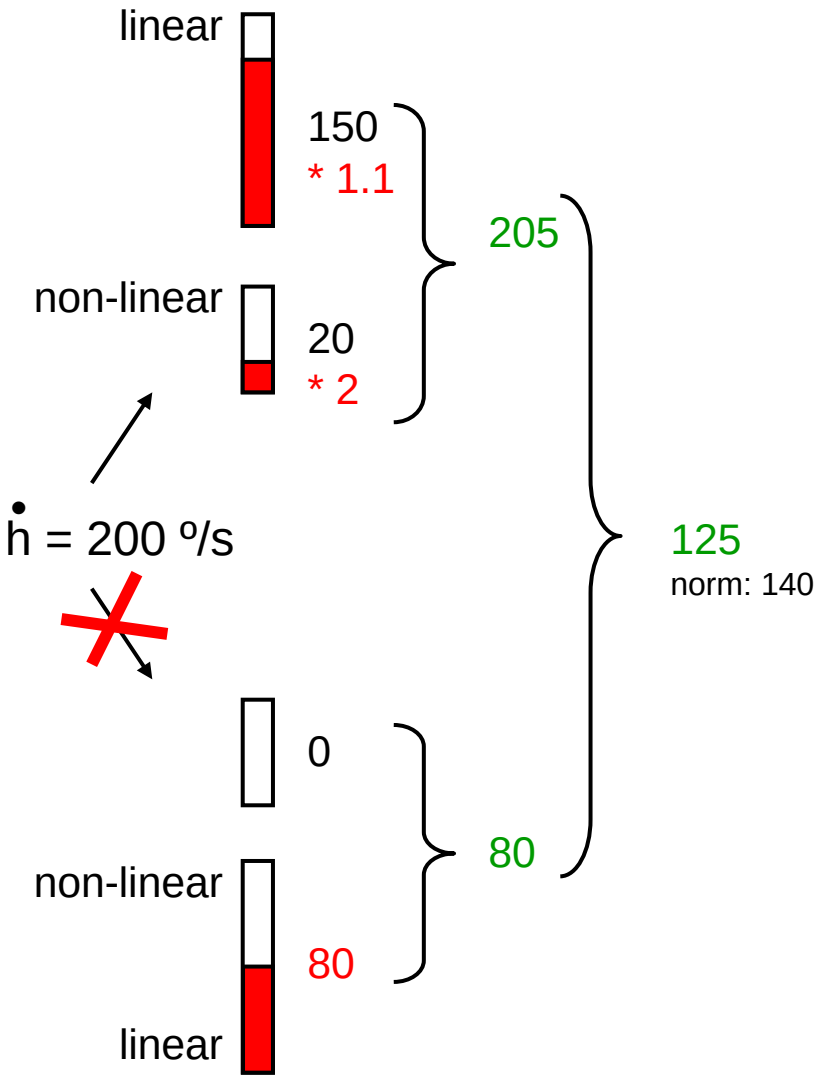


Lasker et al. 2000
(modifiziert)

Head impulse to the right

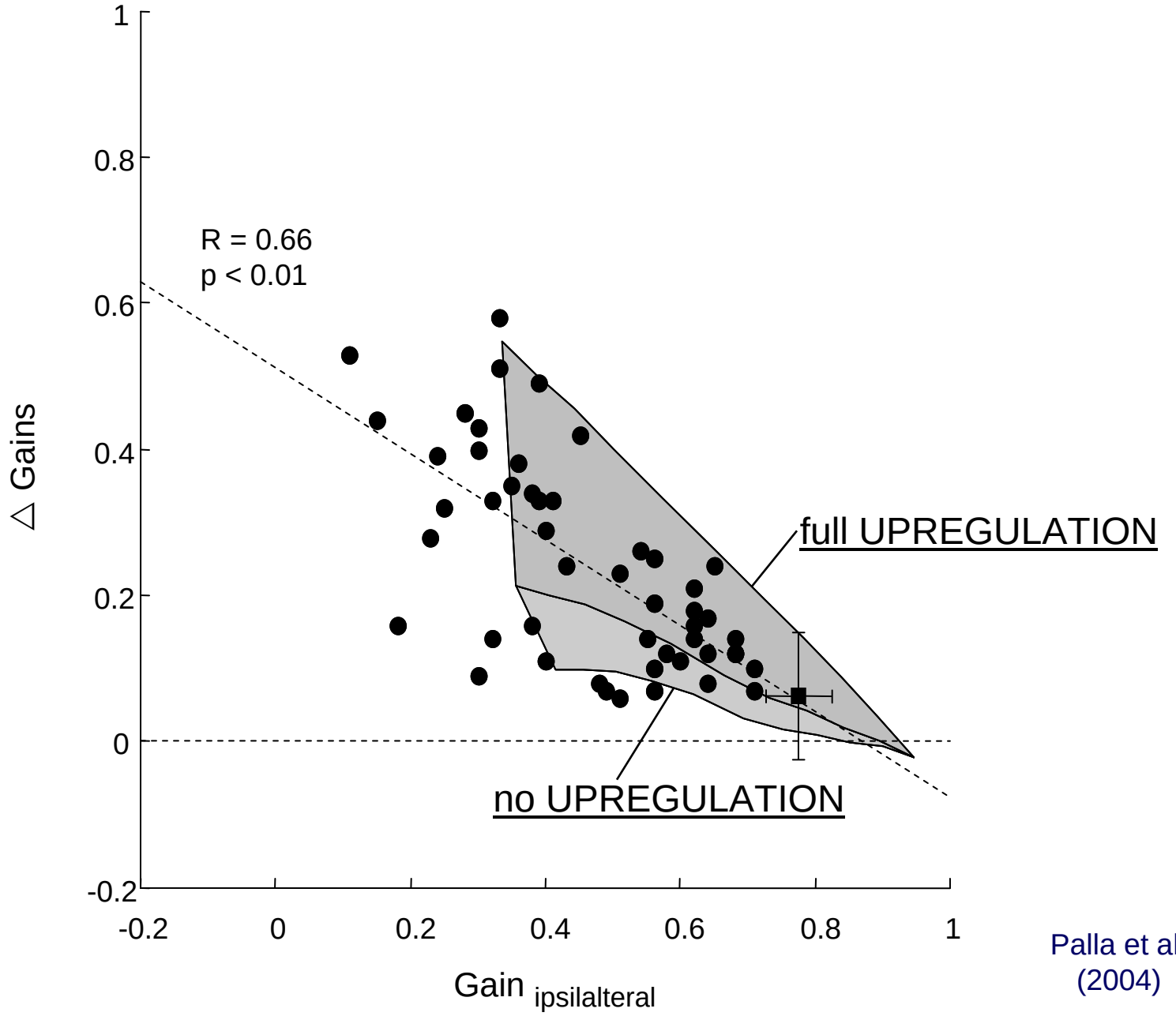


Head impulse to the right



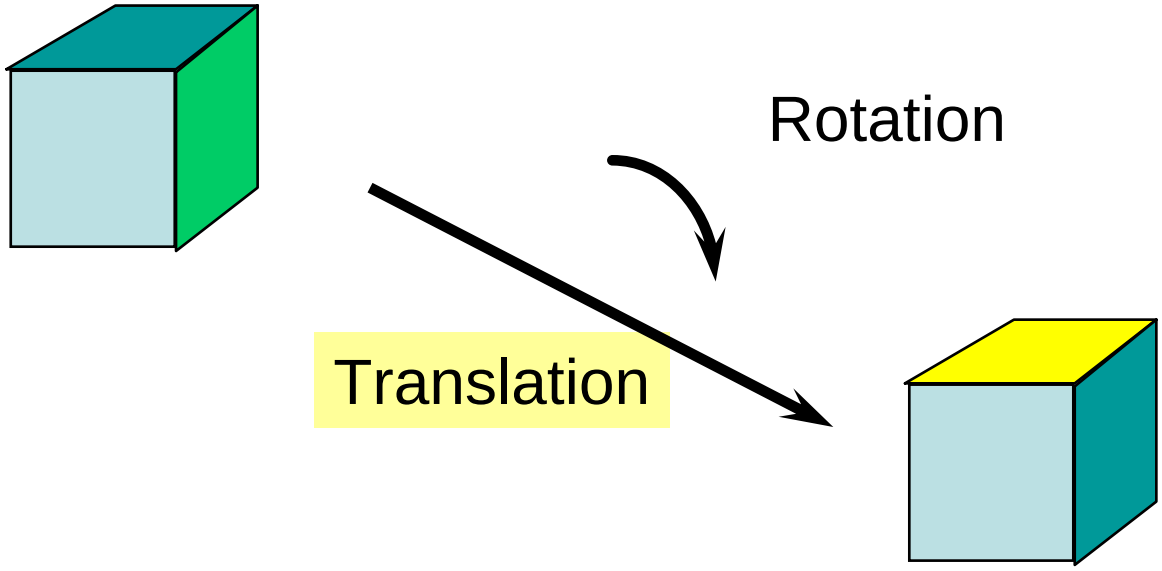
Ein zu tiefer kontralateraler Gain kann das Resultat einer inkompletten zentralen UPREGULATION auf der gesunden Seite sein!

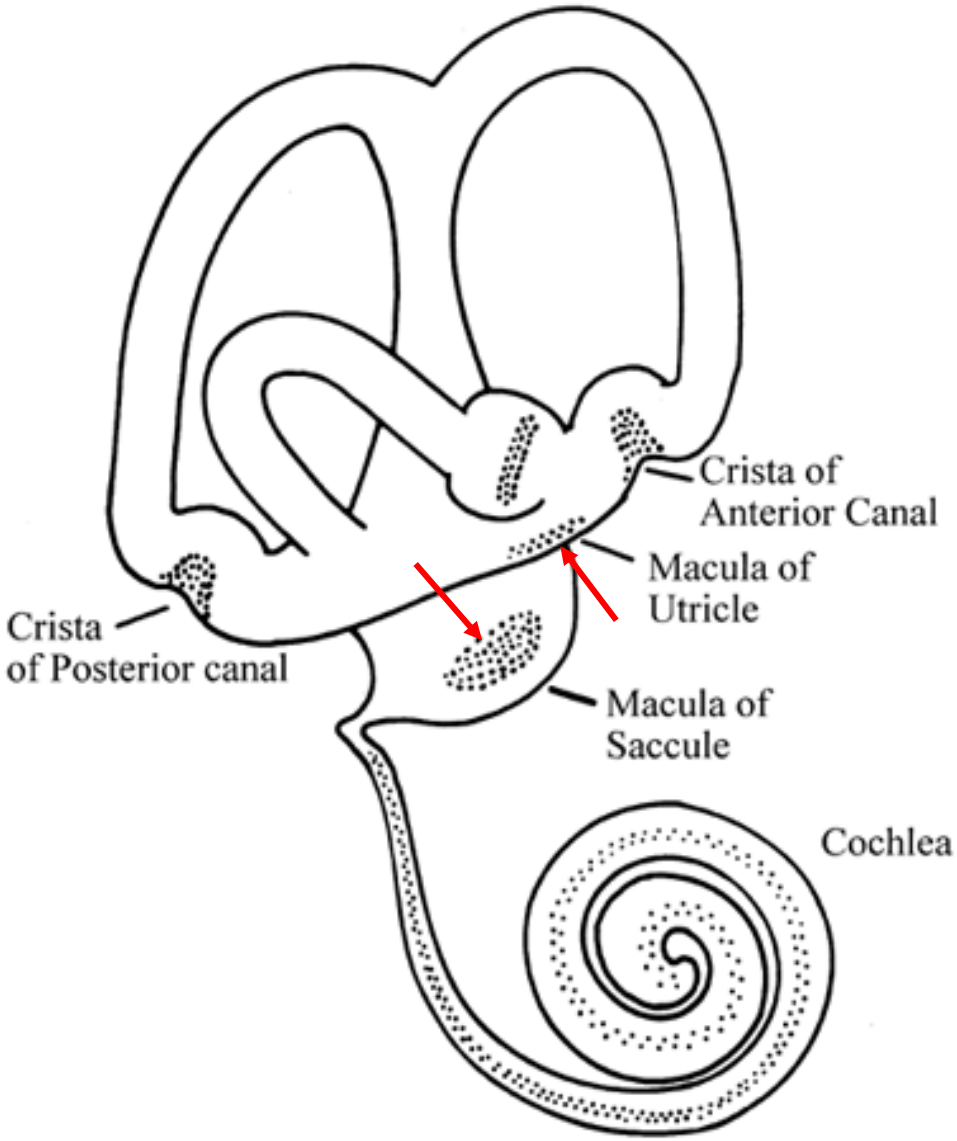
DD:
asymmetrische bilaterale vestibuläre Läsion



Palla et al. (2004)

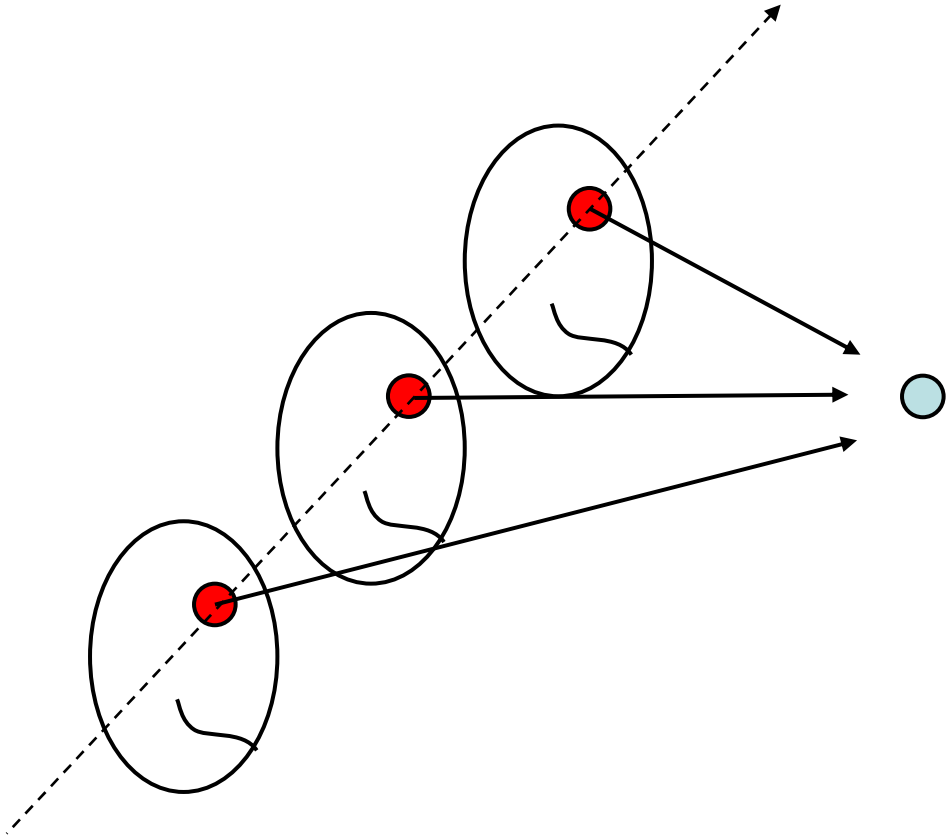
Bewegung

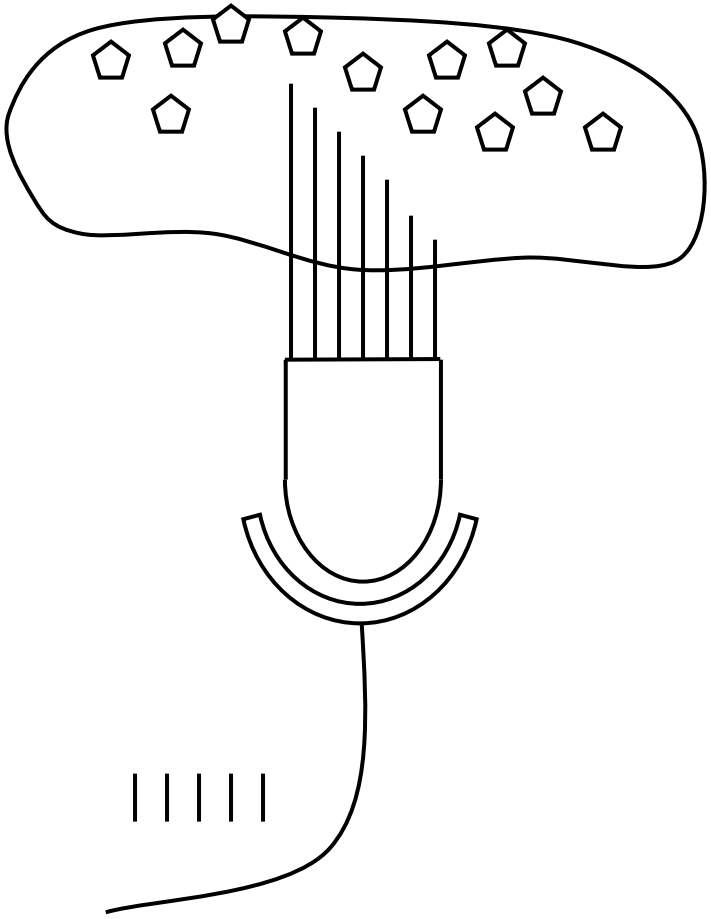


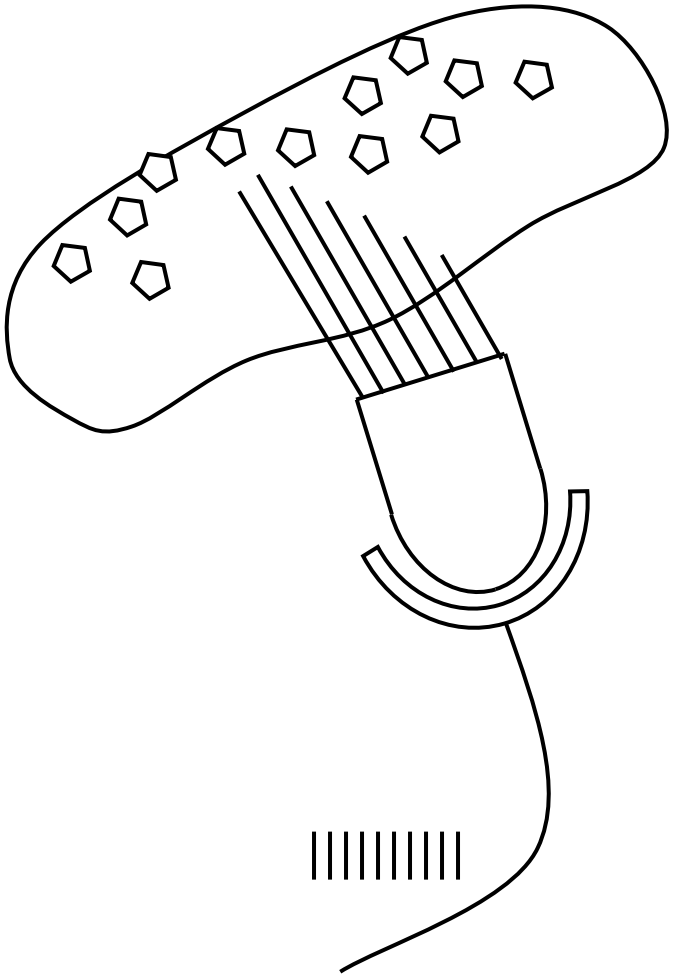


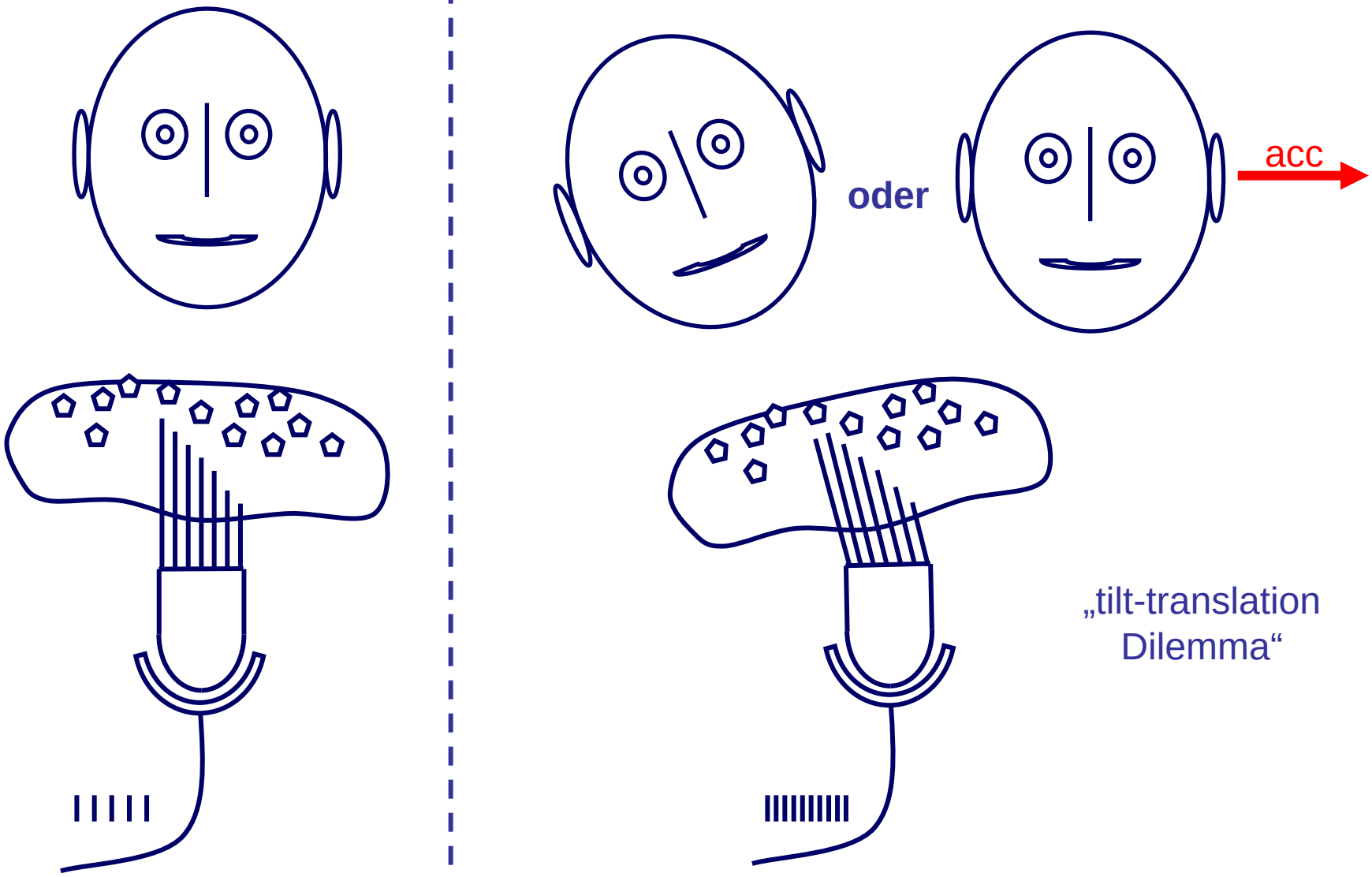
Leigh &
Zee 1999

Linearer vestibulo-okulärer Reflex








oder
acc
„tilt-translation
Dilemma“

Tilt-Translation-Dilemma

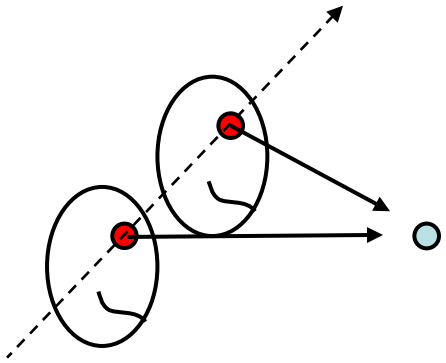
Äquivalenzprinzip:

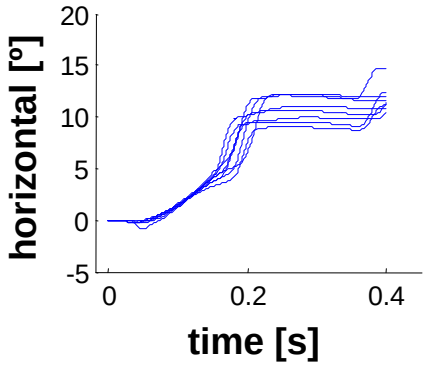
Ein Beschleunigungs-messer kann nicht zwischen Schwerkraft und Beschleunigung unterscheiden.

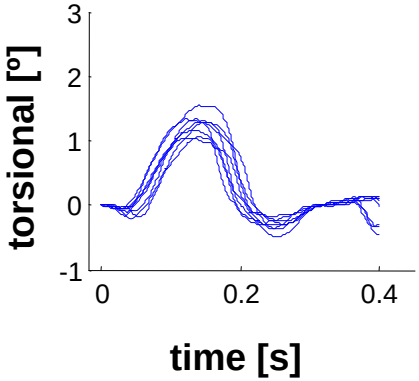
(1907)

Kopfschlitten

Video



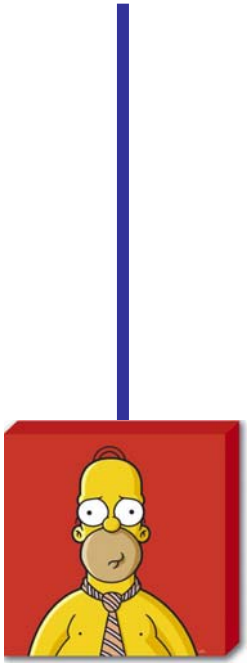

horizontal [°]
20
15
10
5
0
-5
0
0.2
0.4
time [s]

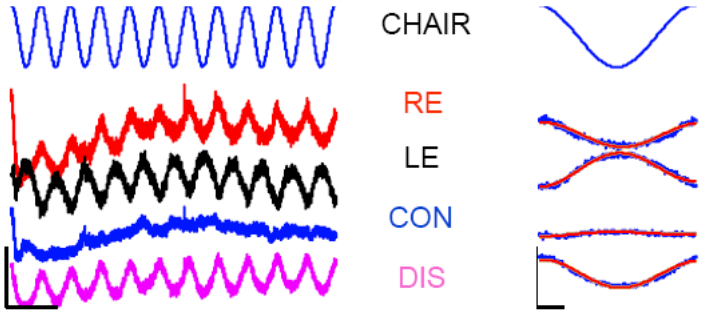

torsional [°]
3
2
1
0
-1
0
0.2
0.4
time [s]

SWAY

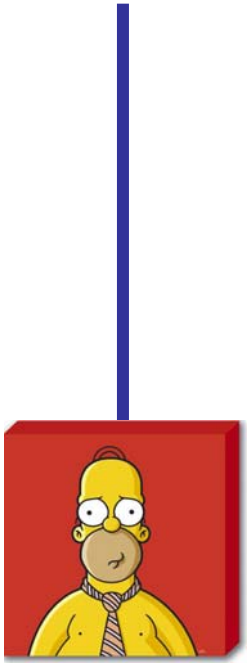
HEAVE

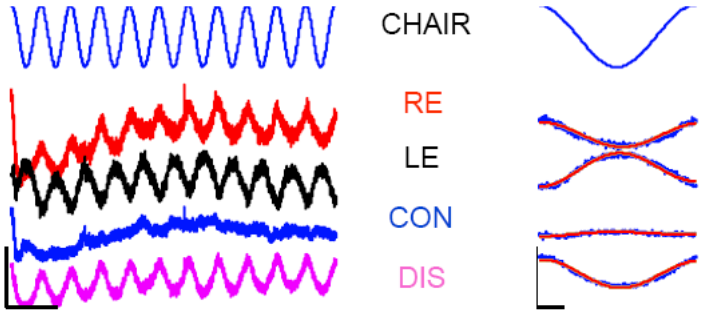
SURGE



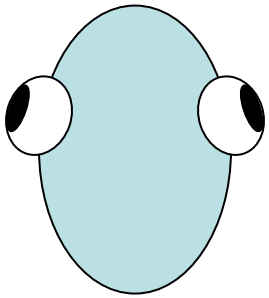


Olasagasti et al. 2008





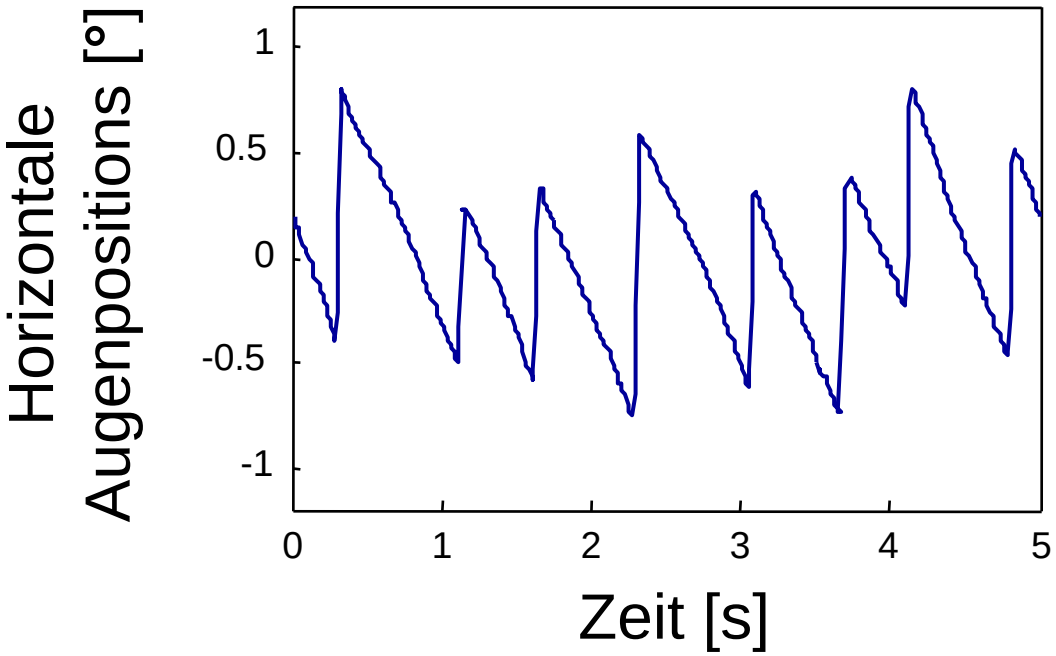
Olasagasti et al. 2008

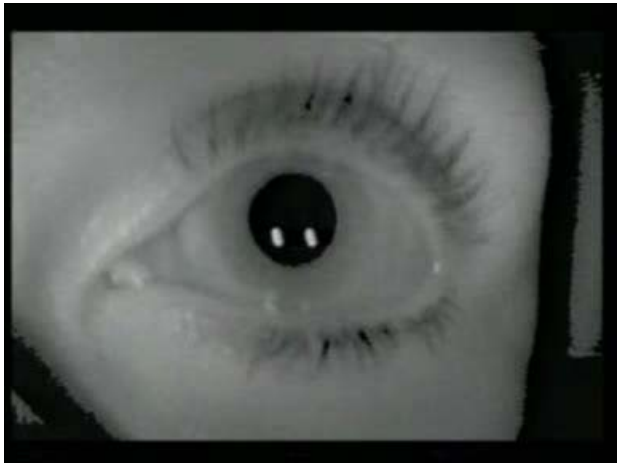


Besteht ein akutes vestibuläres Ungleichgewicht?

HORIZONTALER SPONTANNYSTAGMUS

Horizontaler Spontannystagmus





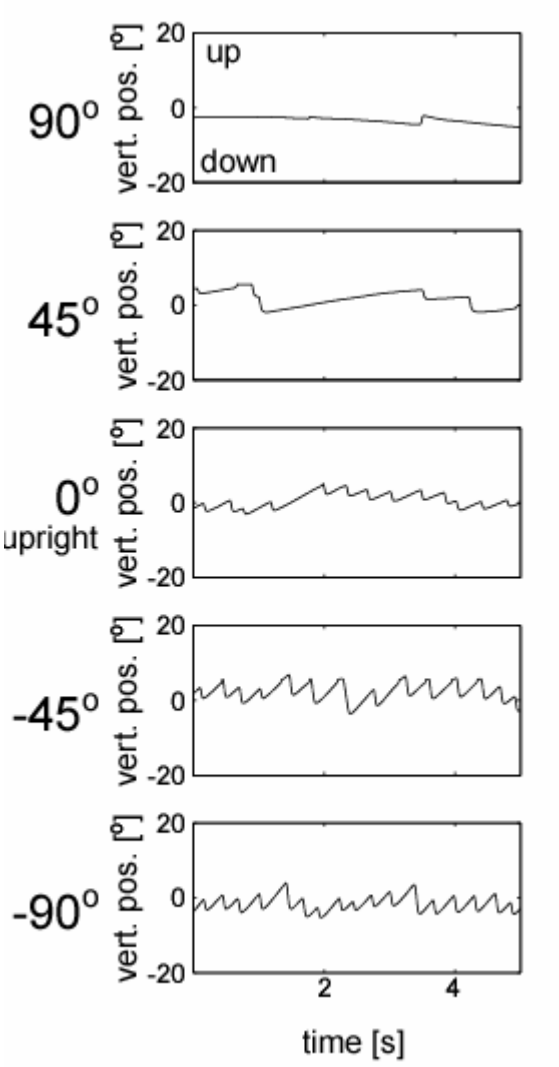
Vertikaler Spontannystagmus

Video

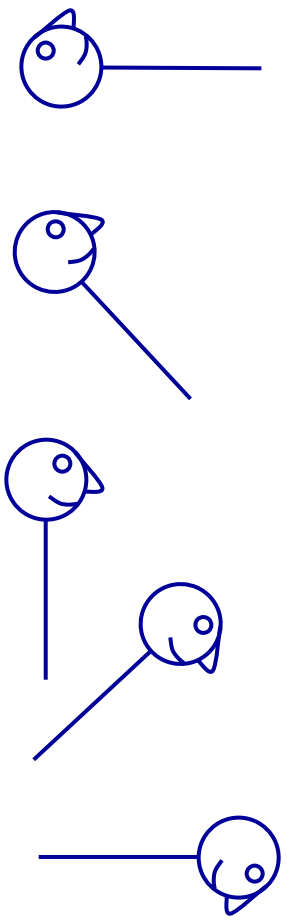
Spontan-Nystagmus

horizontal	vertikal
peripher > zentral (Ausnahme: Rebound-Nystagmus)	zentral

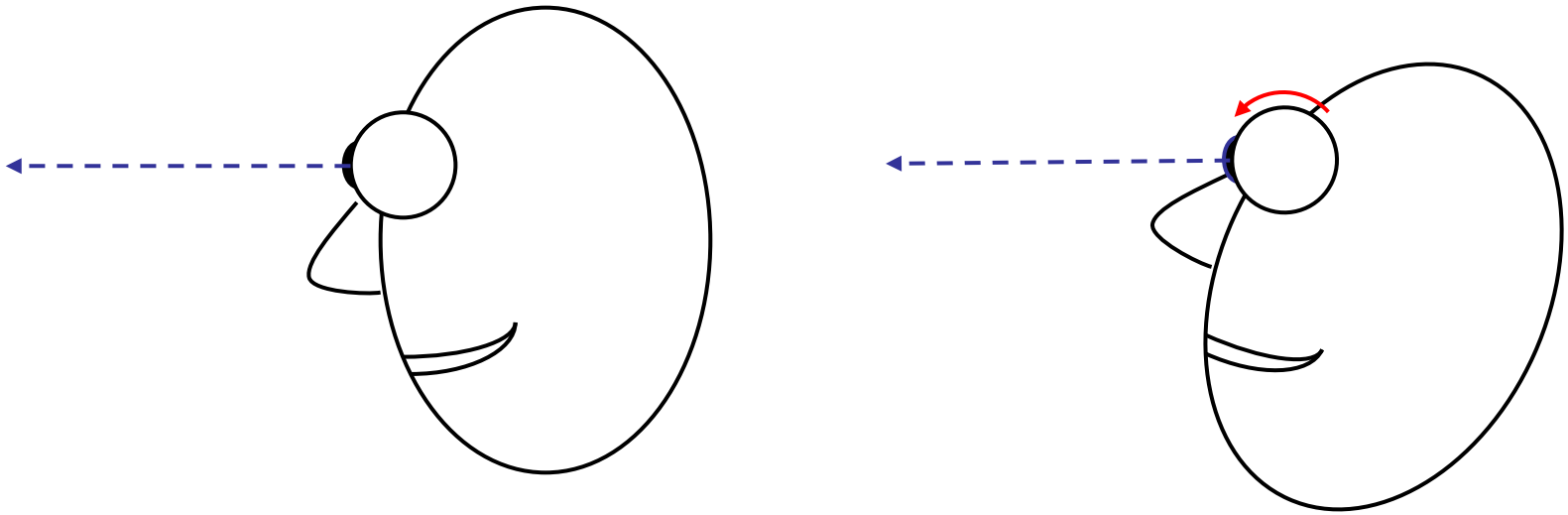
vertikaler Drift



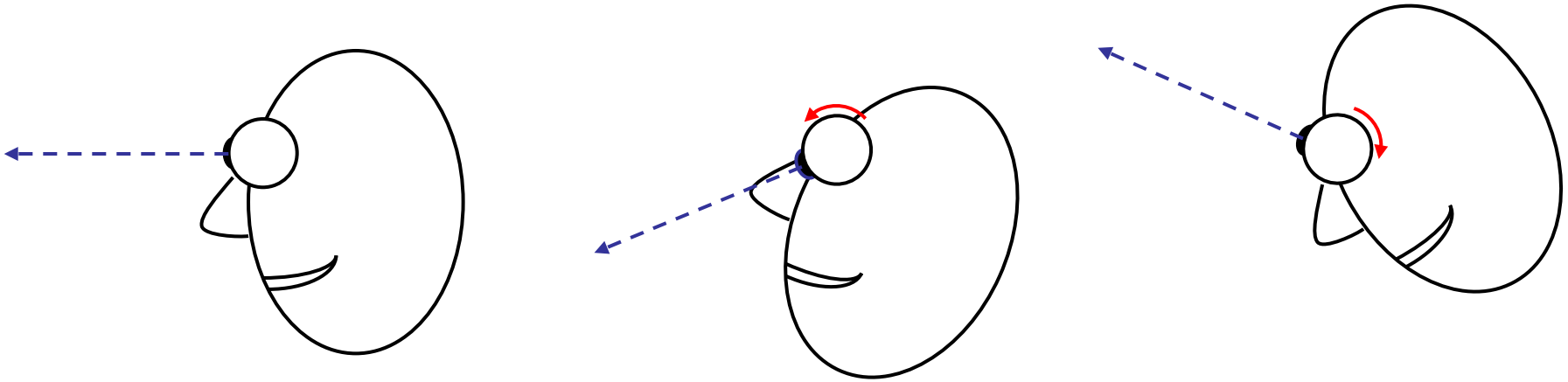
Kopfposition



Ocular counterpitch



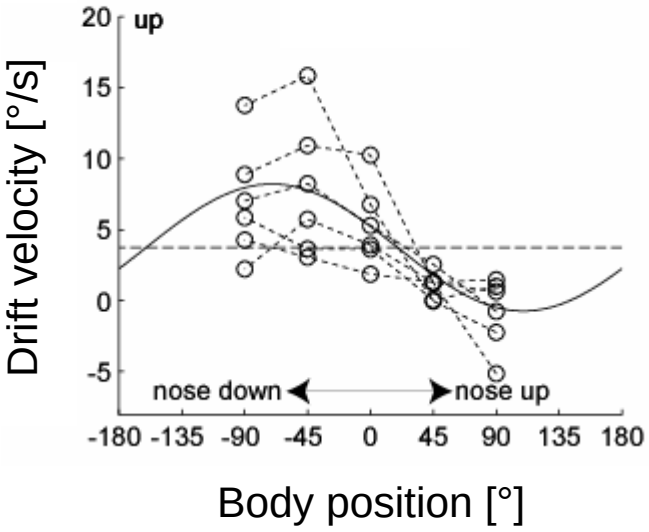
overacting static ocular counterpitch

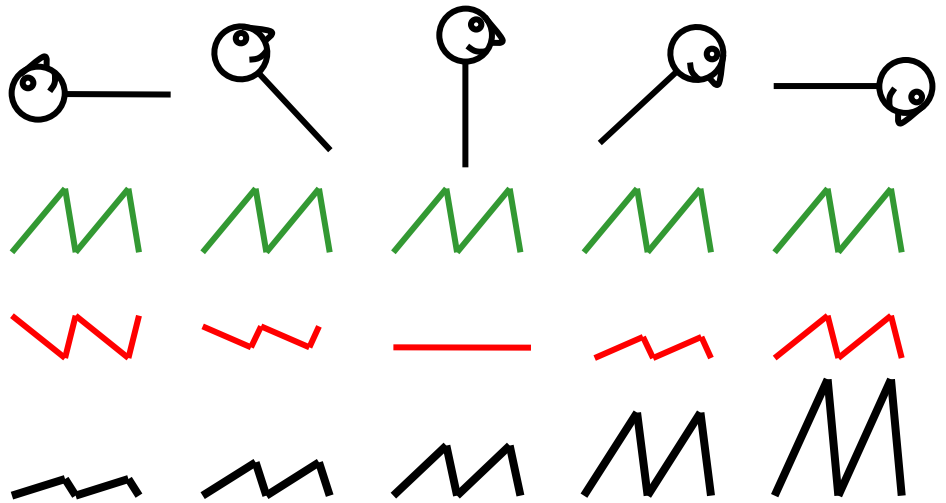


+

DBN

Vertikaler Drift bei KH-Atrophie





gravity-independent

gravity-dependent

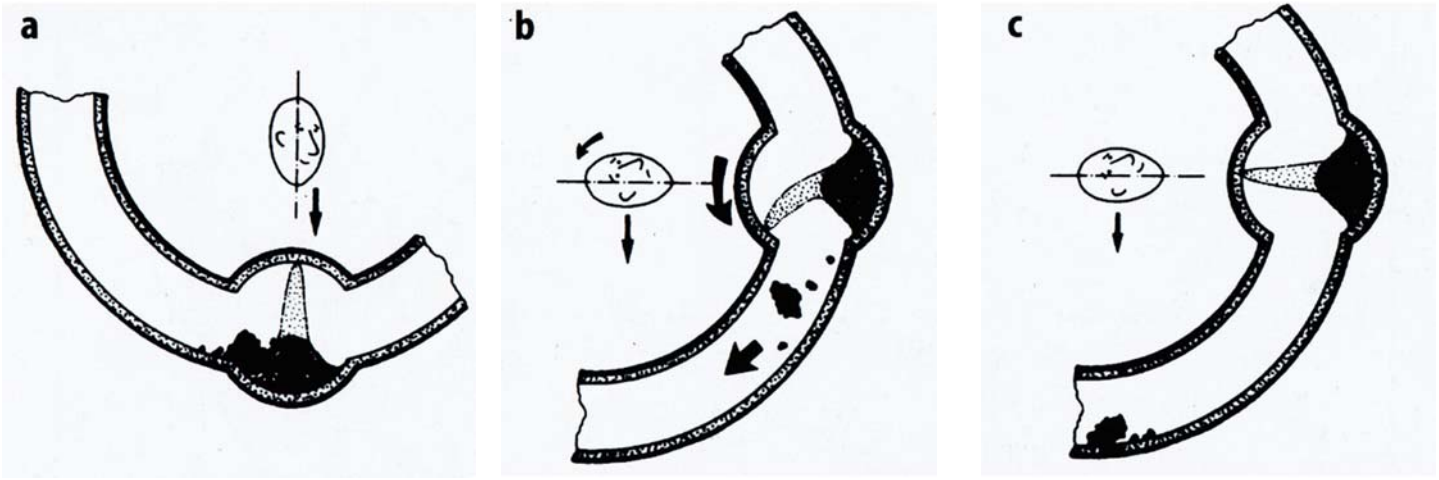
sum

Marti S, Palla A, Straumann D (2002) Ann Neurol

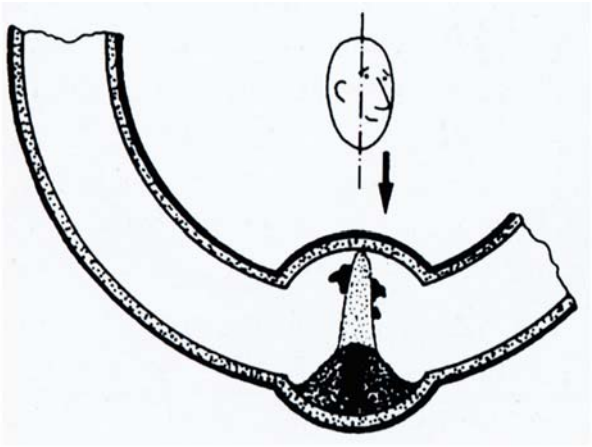
Besteht eine Canalolithiasis?

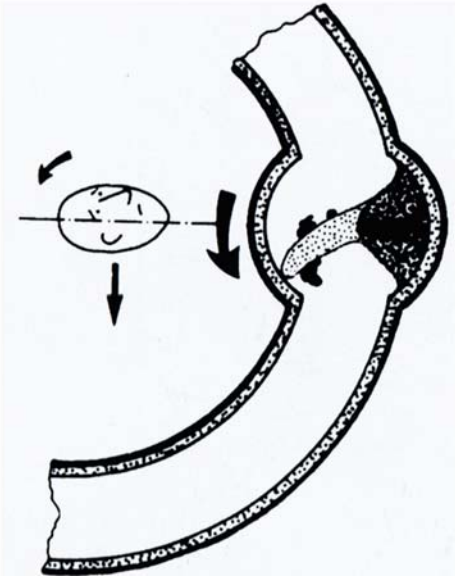
LAGERUNGSMANÖVER

Canalolithiasis



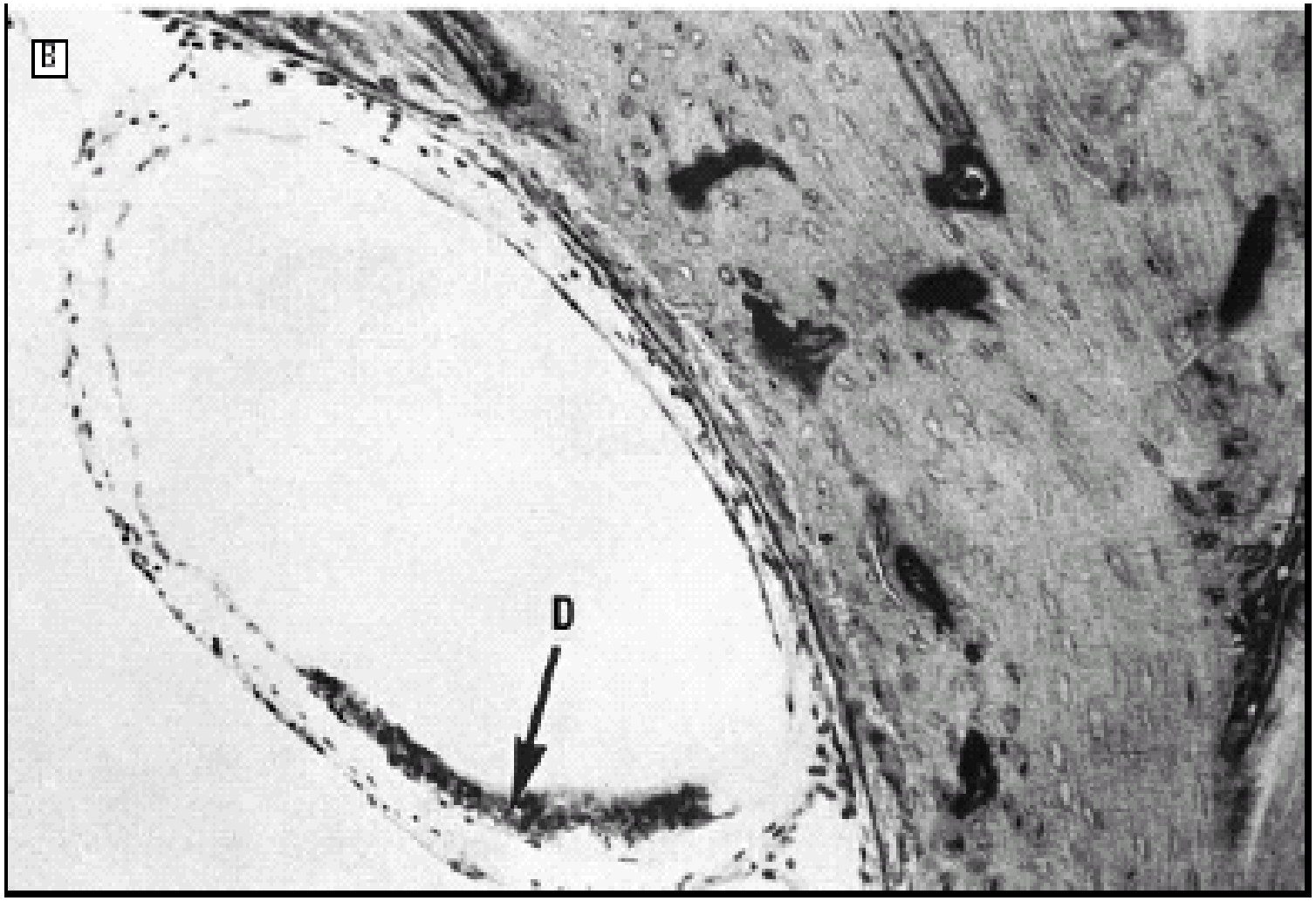
Cupulolithiasis (selten!)





Canalolithiasis

(Hall, Ruby and Mc Clure 1979)

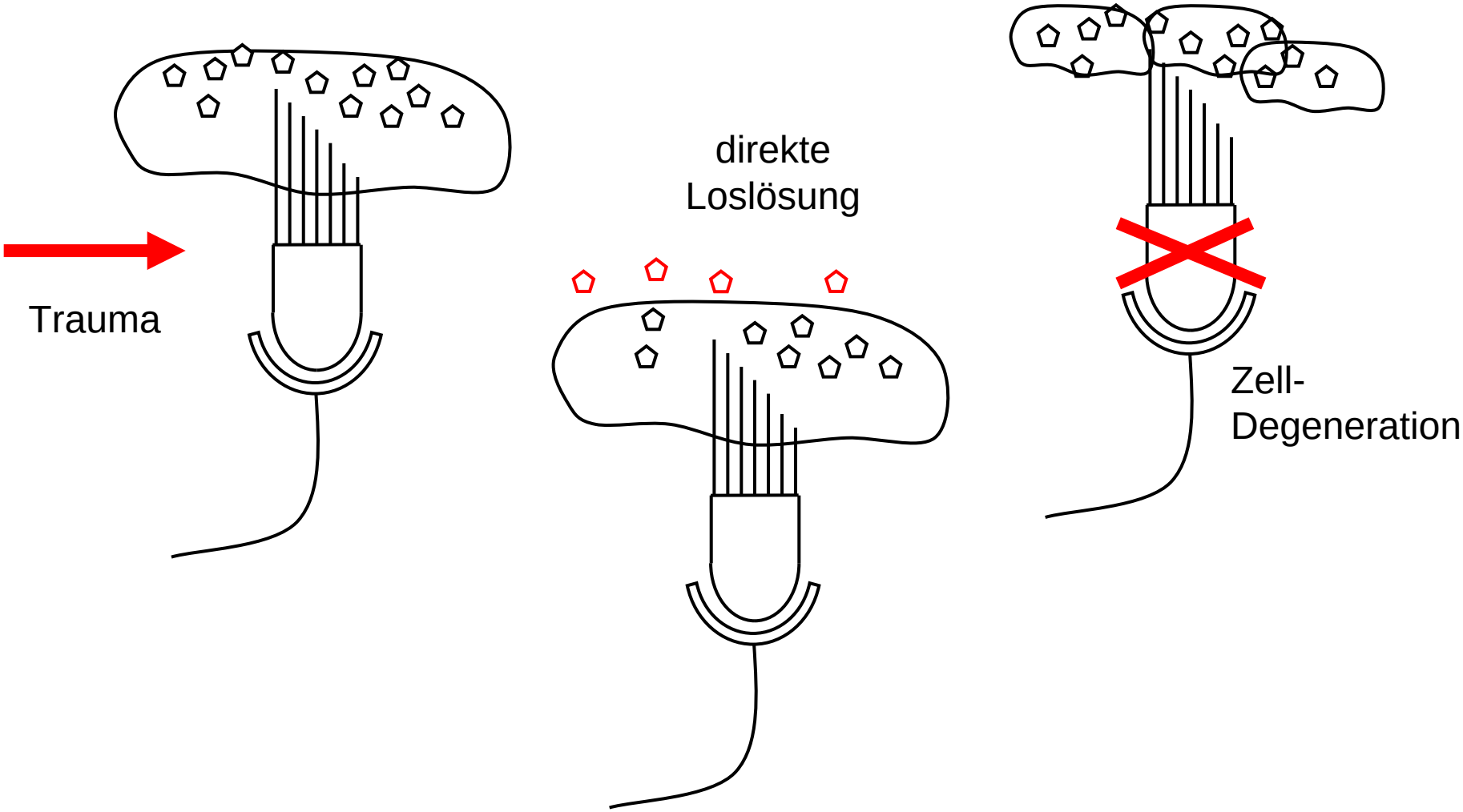


Benigner paroxysmaler Lagerungsschwindel: Häufigkeit

- 50% idiopathisch
- 17% posttraumatisch
- 15% nach vestibulärer Neuritis

Baloh et al. 1987

Commotio / Contusio labyrinthi



	hinterer Bogengang	lateraler Bogengang
Provokations-manöver	**Hallpike**	**Barbecue**
Befreiungs-manöver	**Epley modifiziert**	**GUFONI**

Lagerungsmanöver

1. Hallpike bds.
2. Barbecue 90 Grad bds. mit Repetition
3. Hallpike bds.

Achtung!

Lange genug warten!

Lagerungsmanöver

Posteriore Canalolithiasis

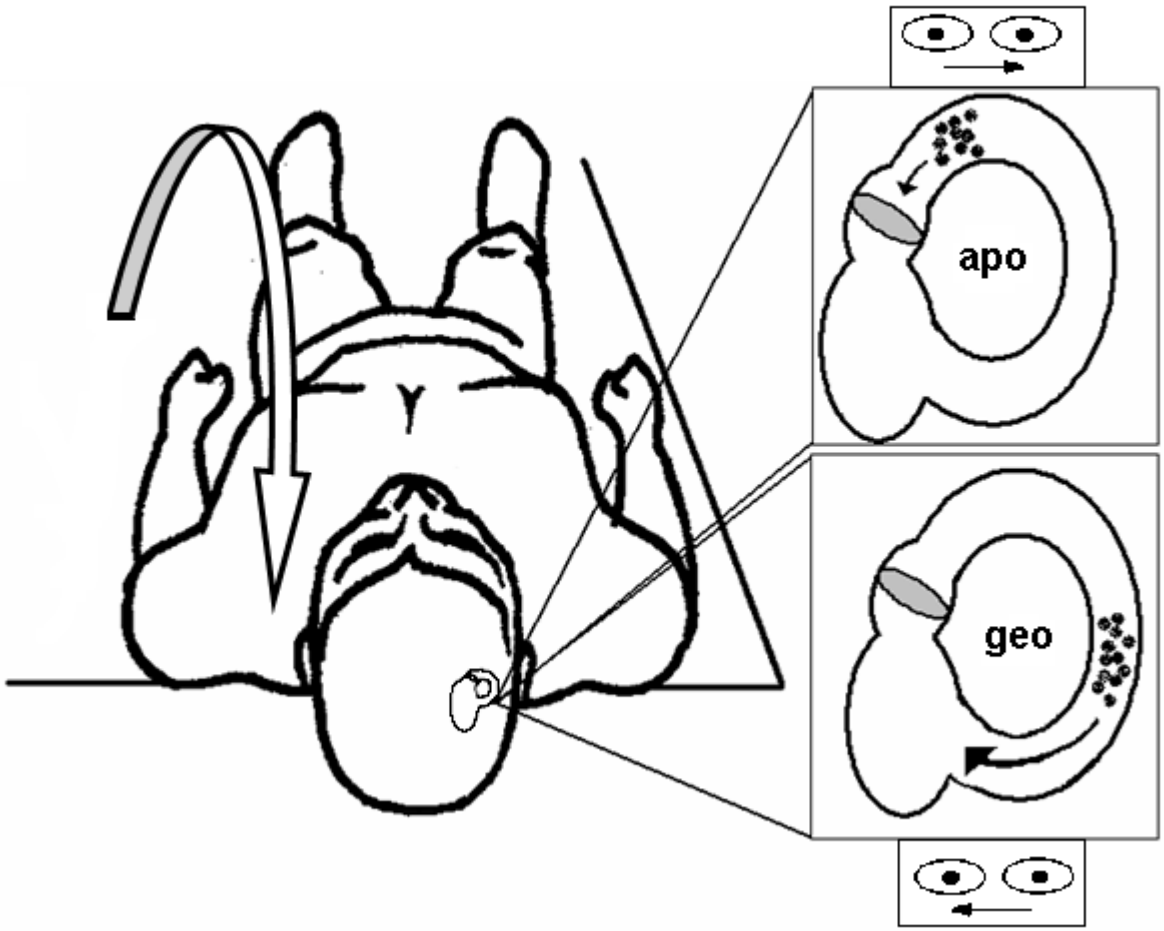
Video

Laterale Canalolithiasis – geotrope Variante

Video

Laterale Canalolithiasis – apogeotrope Variante

Video

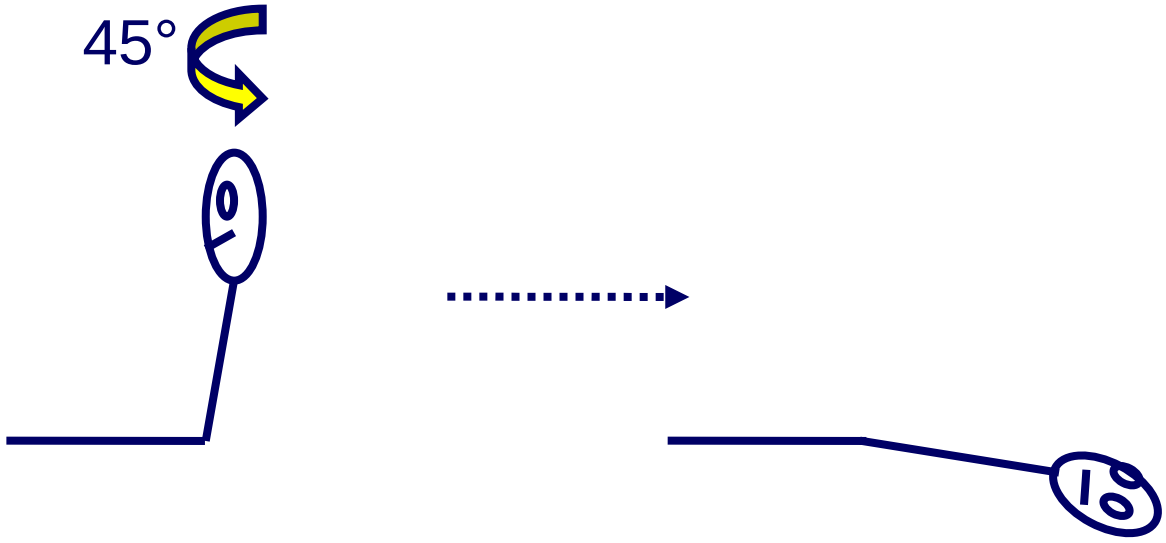

apo
geo

	hinterer Bogengang	lateraler Bogengang
Provokations-manöver	**Hallpike**	**Barbecue**
Befreiungs-manöver	**Epley modifiziert**	**GUFONI**

Epley-Manöver

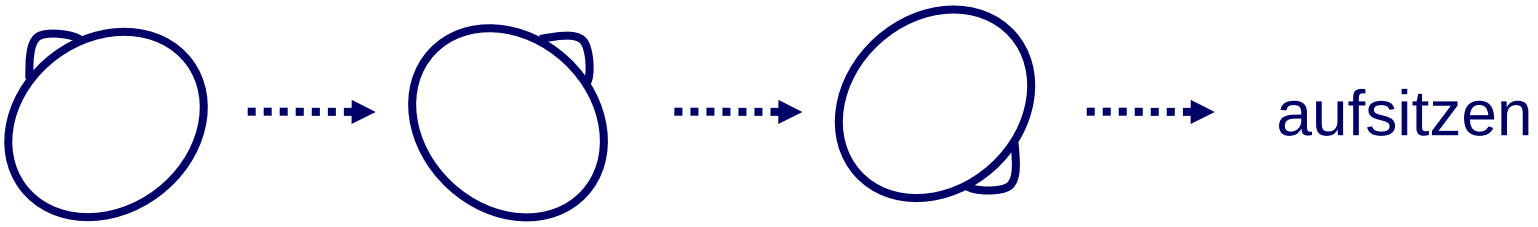
David Solomon

Epley-Manöver links (1)

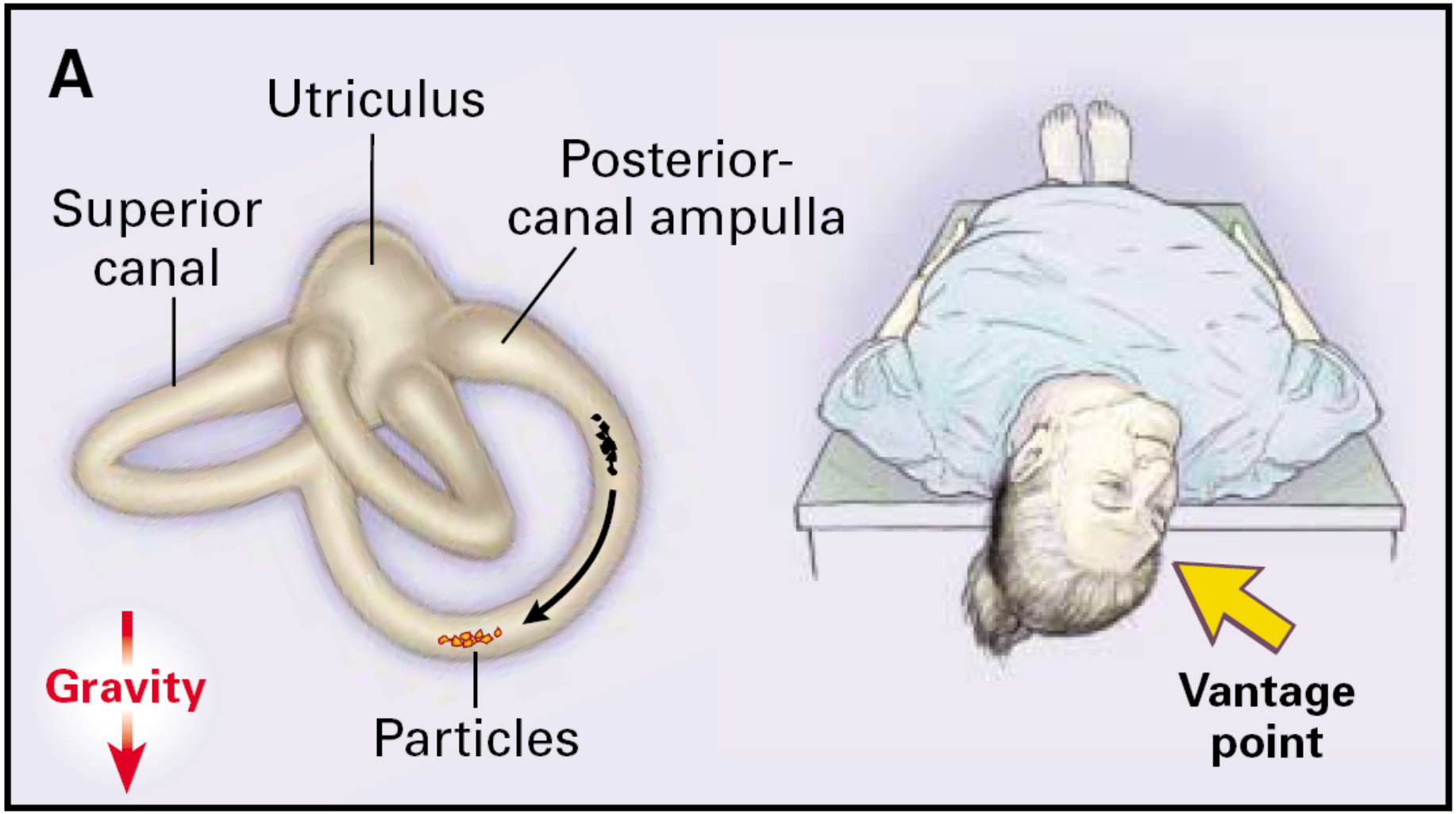


vertikal-torsioneller
Nystagmus

Epley-Manöver links (2)

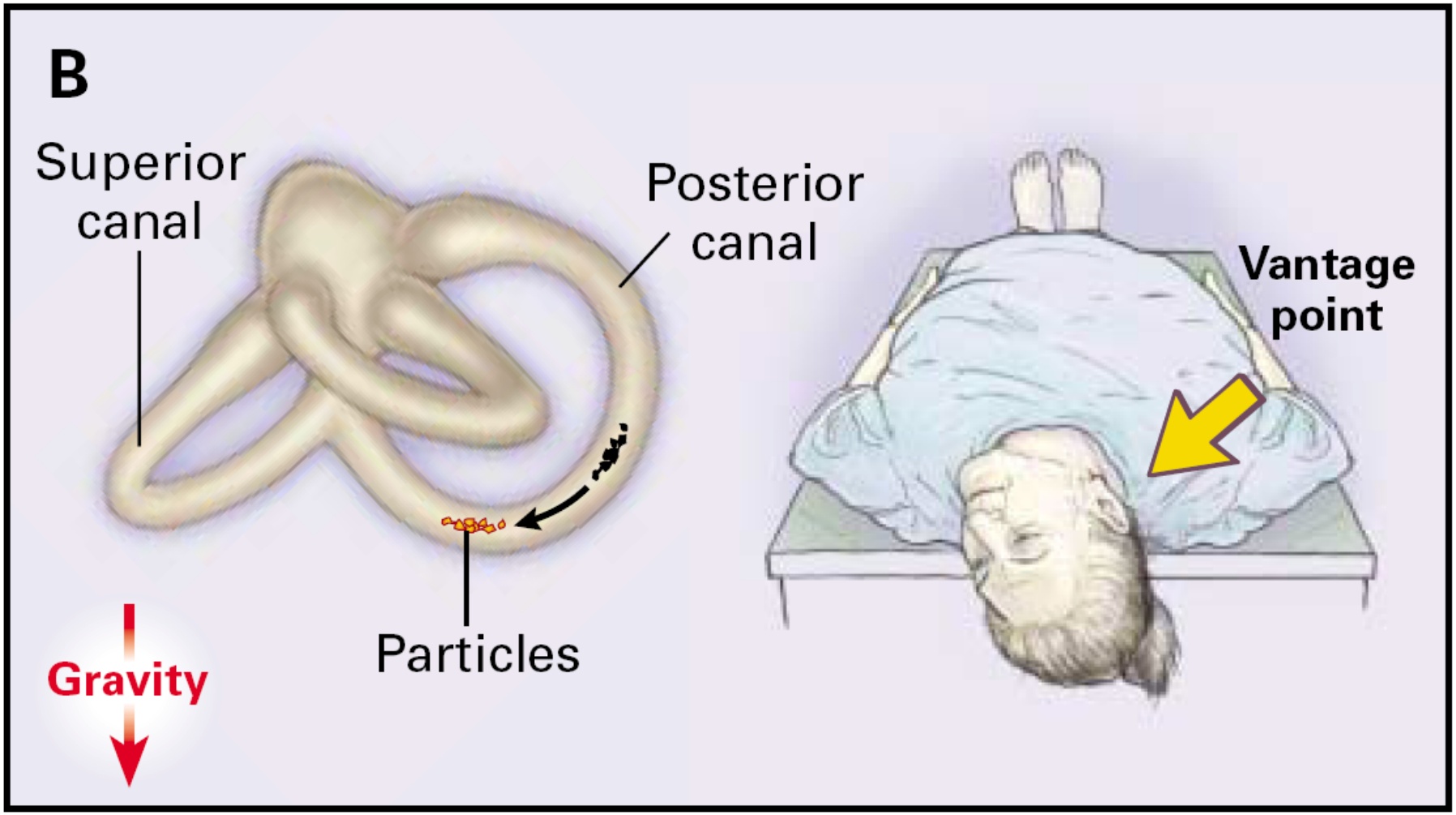


Epley-Manöver



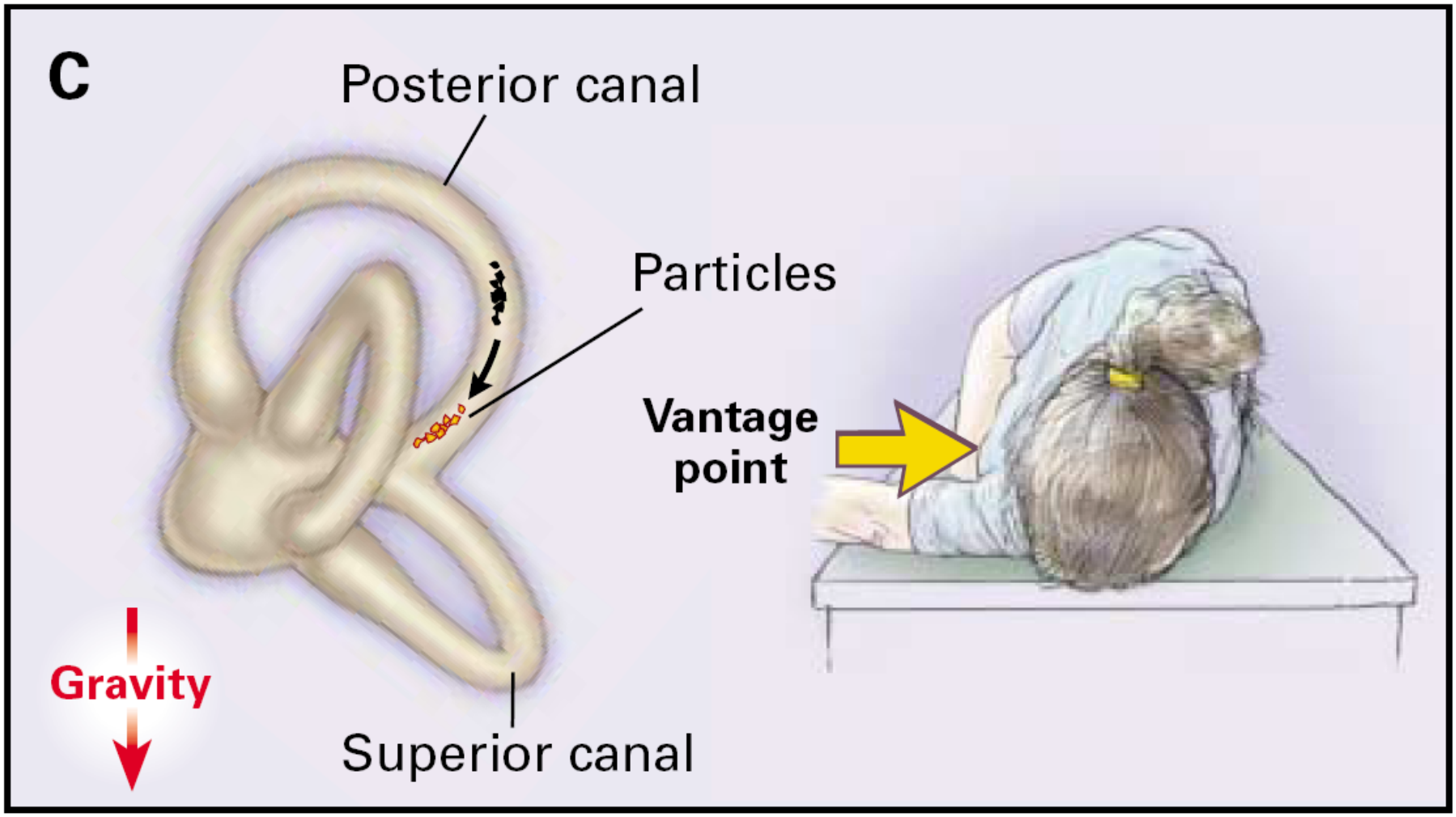
Furman 1999

Epley-Manöver



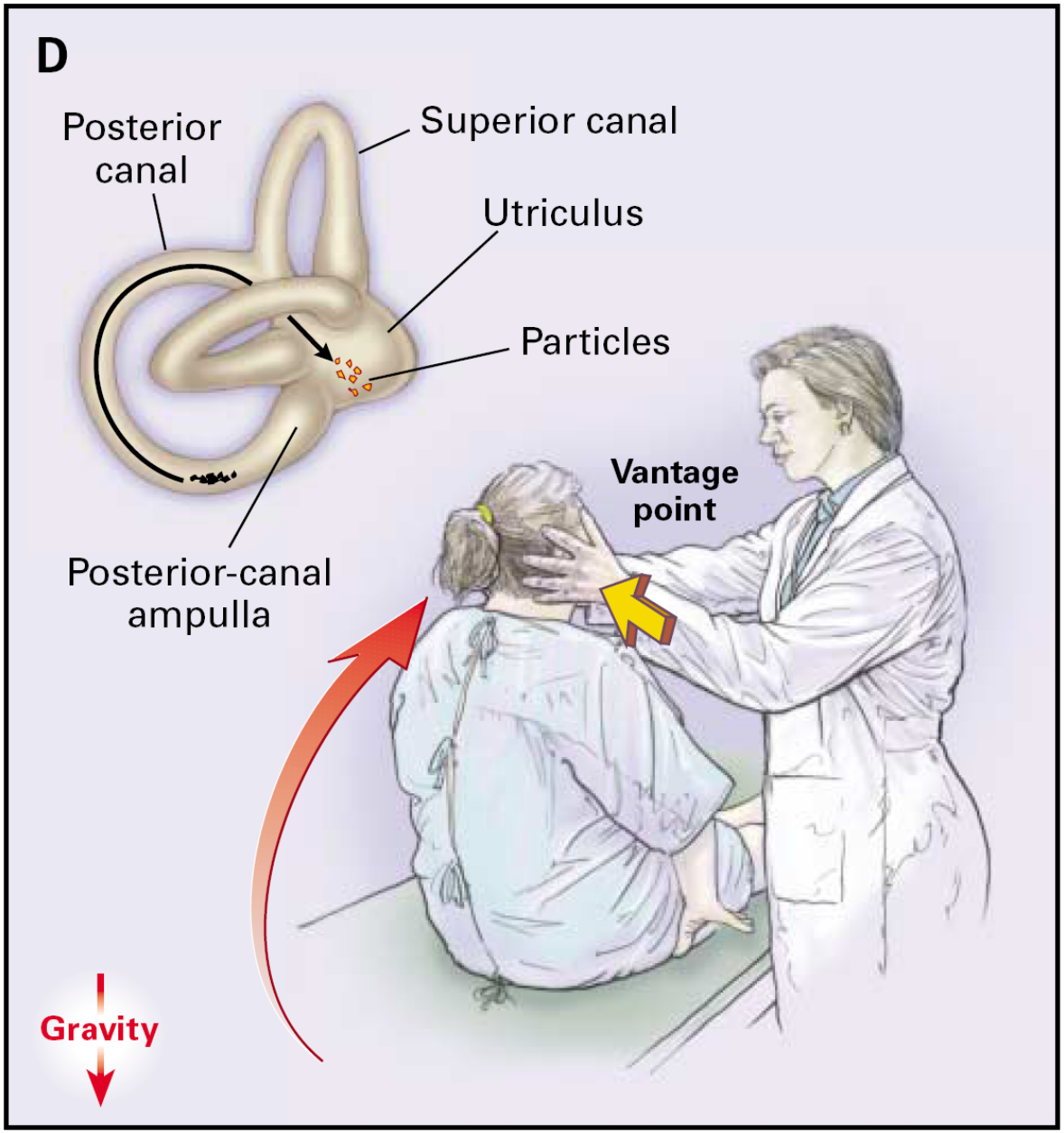
Furman 1999

Epley-Manöver



Furman 1999

Epley-Manöver

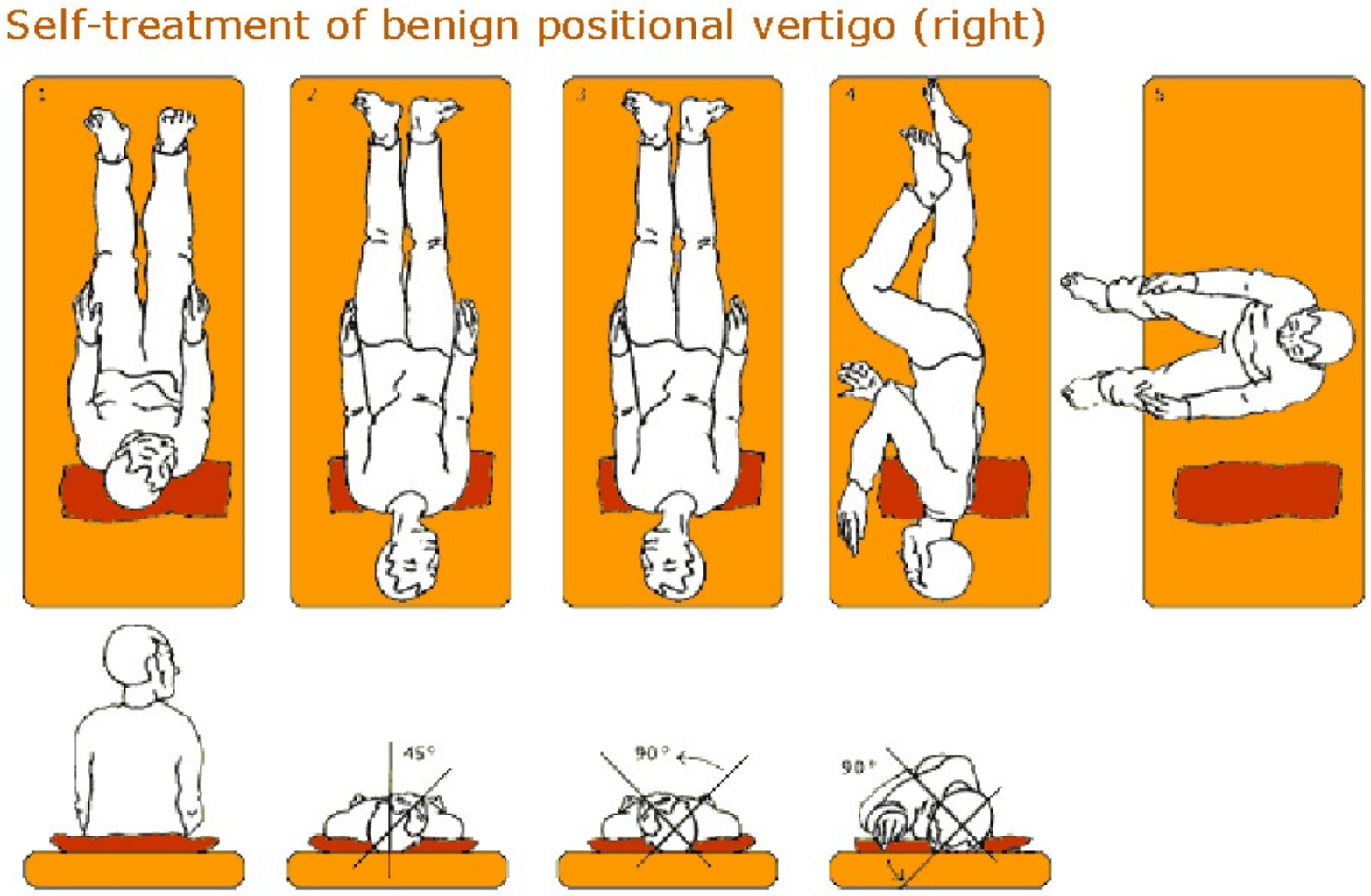


Furman 1999

Epley-Manöver

Epley-Manöver

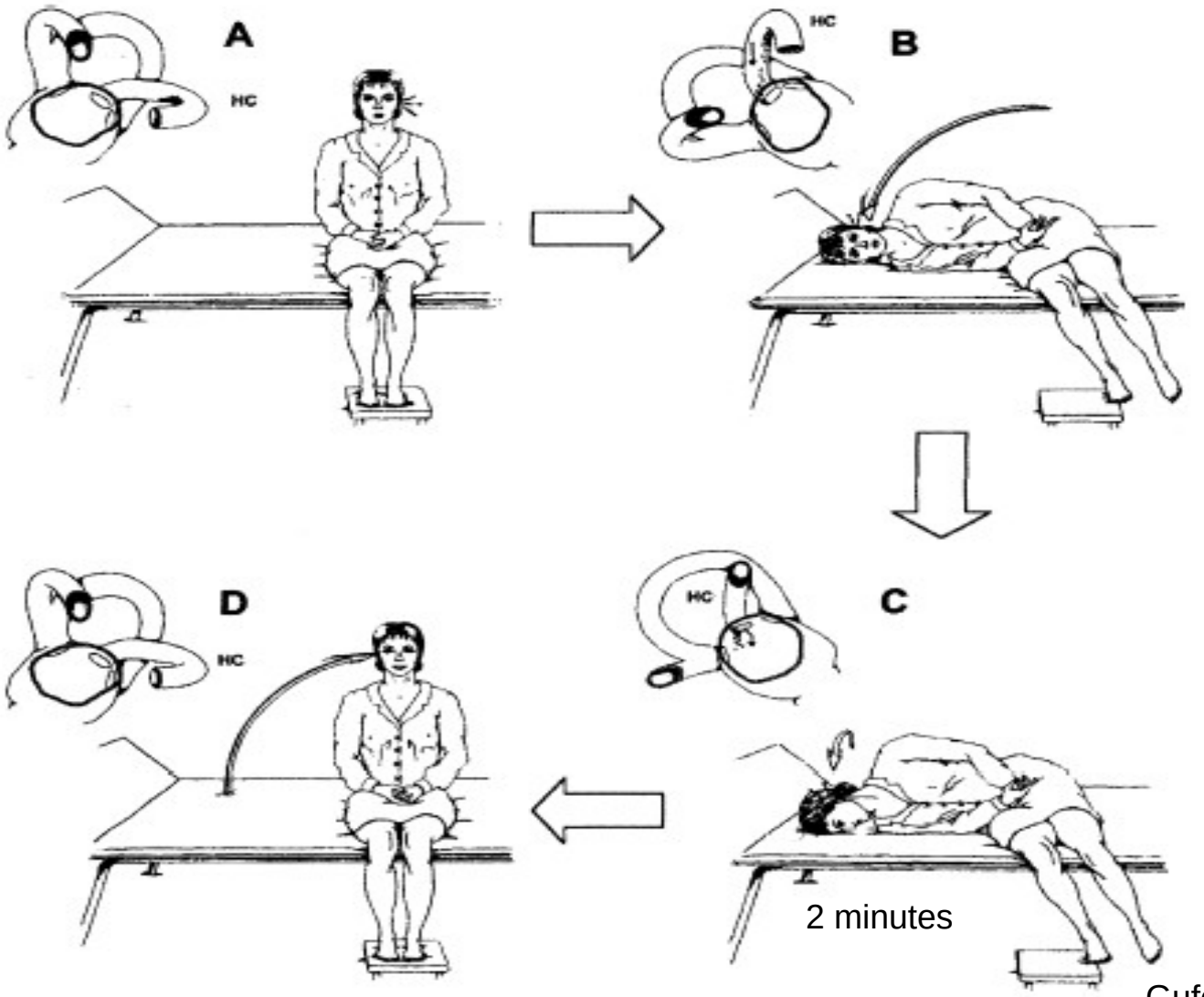
http://www.charite.de/ch/neuro/vertigo.html



Gufoni Manöver

Video

Behandlung der lateralen Bogengangsvariante



Gufoni-Mastrosimone 1999

Gufoni-Manöver

immer zur Seite mit dem geringeren horizontalen Lagerungsnystagmus

Gufoni-Manöver

immer zur Seite mit dem geringeren horizontalen Lagerungsnystagmus

- gesunde Seite in der geotropen Variante
- betroffene Seite in der apogeotropen Variante

Bemerkungen zu den Canalolith-Repositionsmanövern (1)

- „Mobilisation“ der Canalolithen mit Klopfen oder Vibration
- Unmittelbar nach der Reposition verspüren viele Patienten einen Zug in Richtung des betroffenen Labyrinths (Canalolithen auf dem Utriculus?).
- Therapie-Kontrolle: nochmaliges Hallpike-Manöver ev. mit weiterem Epley-Manöver
- Leichte Gleichgewichtsstörungen während der ersten drei Tage sind üblich.

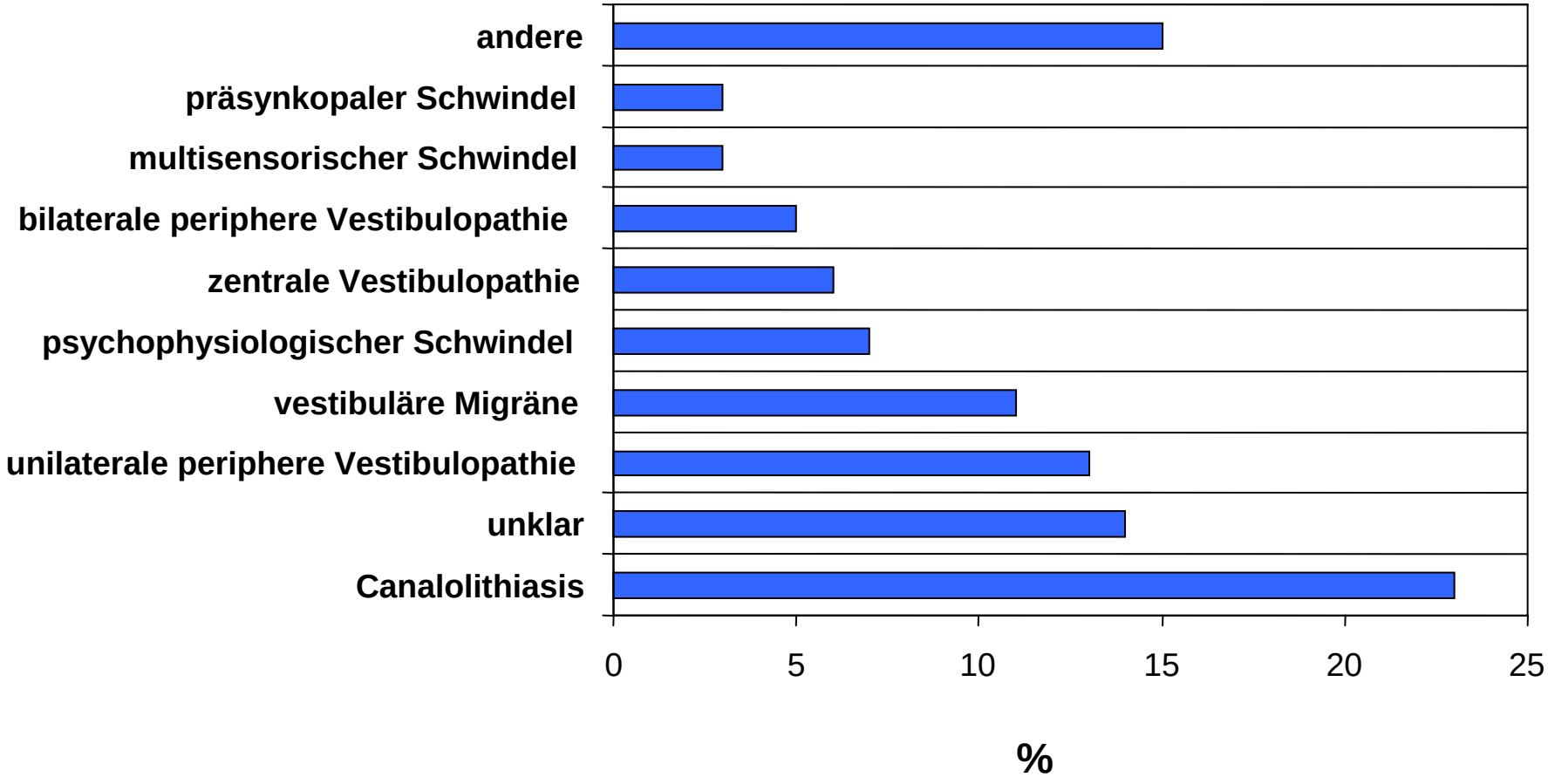
Bemerkungen zu den Canalolith-Repositionsmanövern (2)

- Der Patient soll danach während drei Tagen Erschütterungen (Joggen, Sprünge) und Kopftieflage (Zahnärzte!) vermeiden.
- Nach drei Tagen telefonische Rückmeldung nach vorgängigem selbstständigem Hallpike-Manöver
- Ev. Wiederholung des Manövers bei Persistenz des Lagerungsschwindels
- Therapieerfolge nach Epley-Manöver: 90%; nach Gufoni: ca. 90%

73% der Zuweisungsdiagnosen: „unklarer Schwindel“

↓

Enddiagnosen:



www.vertigocenter.ch/straumann