

VLOGA ŽIVČNEGA SISTEMA PRI ALPSKEM SMUČANJU

**Merging the science of sport with principles
of neuroscience**

Alpsko smučanje zaradi svoje "kaotičnosti" lahko umestimo v skrajno obliko agilnosti.

ALPSKO SMUČANJE KOT KOMPLEKSNA VEŠČINA AGILNOSTI

Vibracije, perturbacije, spremembe smeri, visoke hitrosti, nepredvidljive razmere.. **zahtevajo mnogo več kot le dobro razvito moč, jakost...**

Visoke hitrosti in kaotičnost okolja, zahtevajo **elitne vidne, vidnomotorične ter procesijske kapacitete.**

Visoko tveganje za številne poškodbe kot je ACL, multiligamentarne poškodbe, LBP.

Visoka zahteva po **subkortikalnem procesiranju gibanja** (avtomatizem) in s tem **razbremenjenimi kognitivnimi** kapacetetami za procese kot so odločanje, double task, reaction abilities, anticipation, search strategies and attention span.

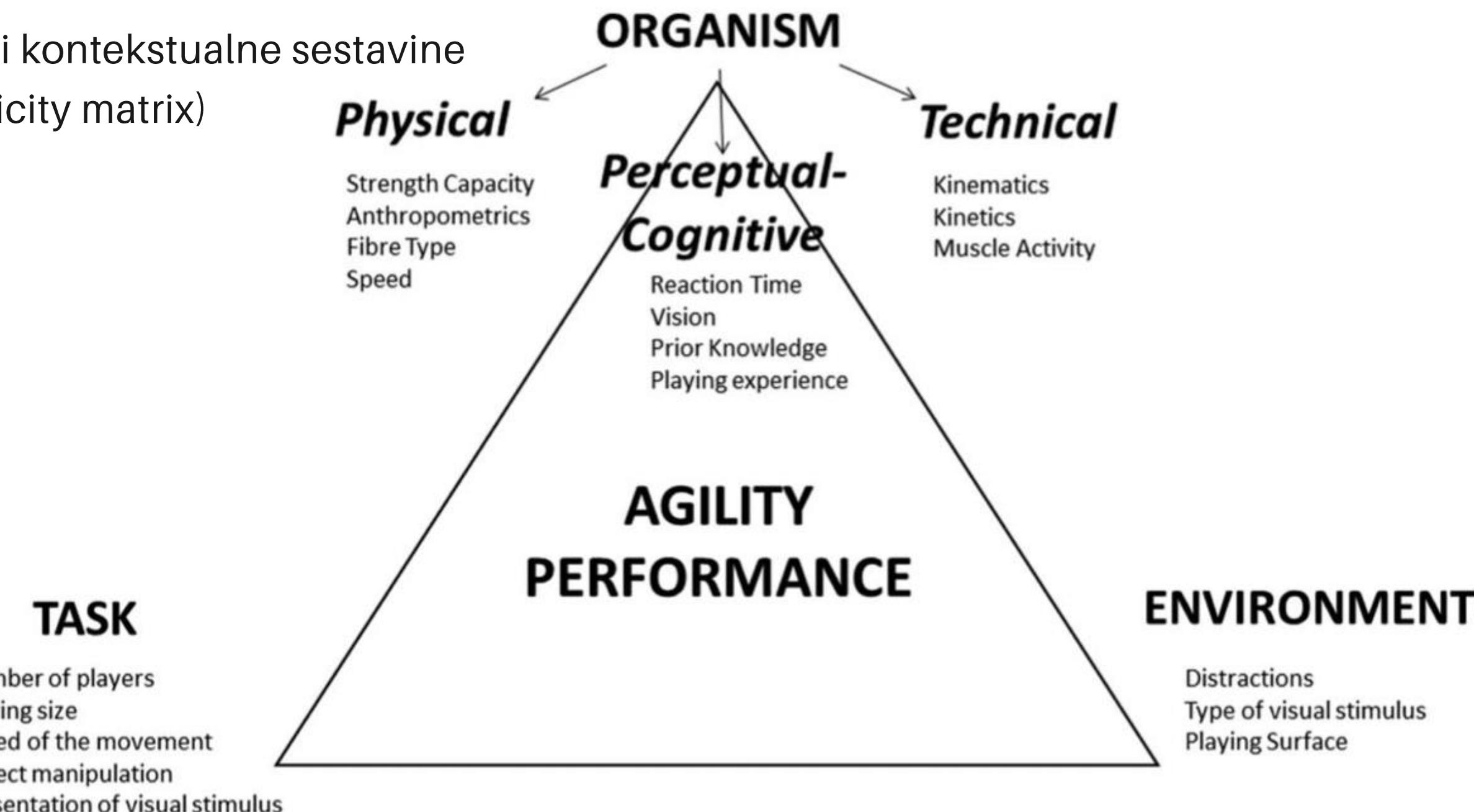


ALPSKO SMUČANJE IN INTEGRACIJA PERCEPCIJSKIH ASPEKTOV

Poleg pomembnih fizičnih, tehničnih in taktičnih kvalitet so izjemnega pomena **percepcijske in kognitivne funkcije**.

Elitni športniki kažejo **superiorne vidne, kognitivne ter percepcijske funkcije**.

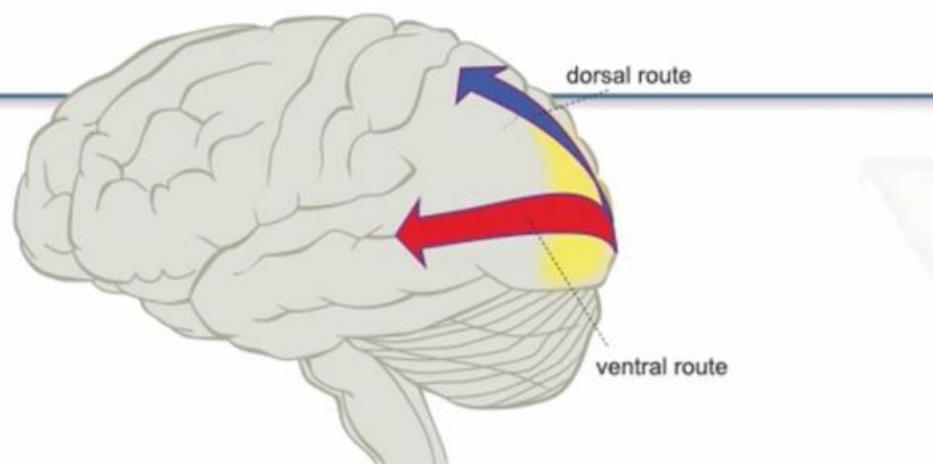
Športno specifični trening mora vsebovati kontekstualne sestavine športa (3Ps, senzomotorični paket, specificity matrix)



PERCEPCIJSKO-KOGNITIVNA TER MOTORIČNA UREDITEV CŽS

Športi, kjer naloga in okolje zahtevata izjemno hitro premikanje organizma, zahtevajo avtomatsko gibanje z implicitnim načinom kontrole.

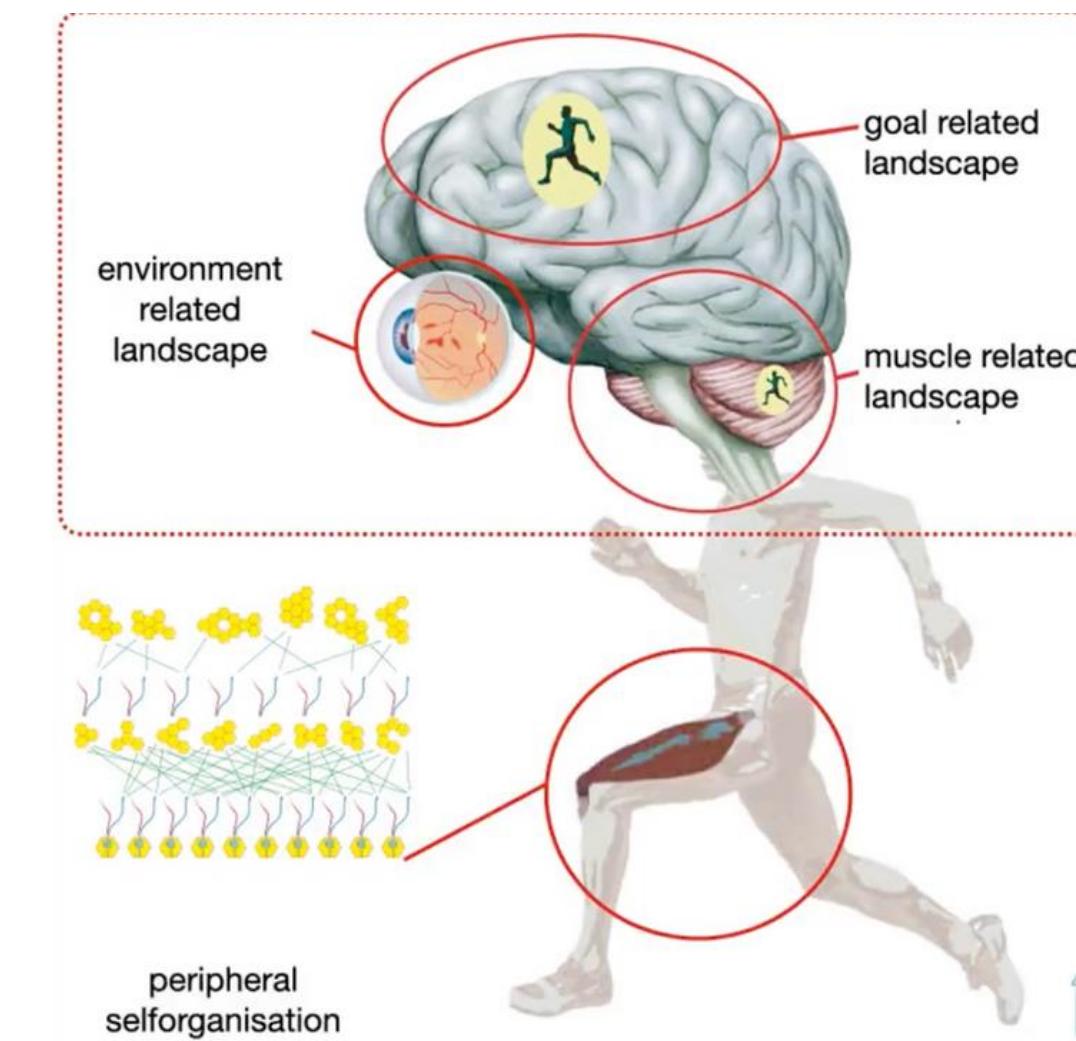
Gibanje in višje procesiranje mora biti strogo ločeno. Polna zavestna kontrola med smučanjem prepovedana! Ventral path mora biti prosta za višje kognitivne funkcije kot je odločanje, anticipacija, double tasking..



Ventralna pot ne sme prevzeti kontrolo dorzalne poti.

Implikacija za trening/ rehab!

Ventral Pathway	Conscious Control Goal Setting	Go/No Go
Dorsal Pathway	Automated Control Trust Confidence In the Moment	Swing control

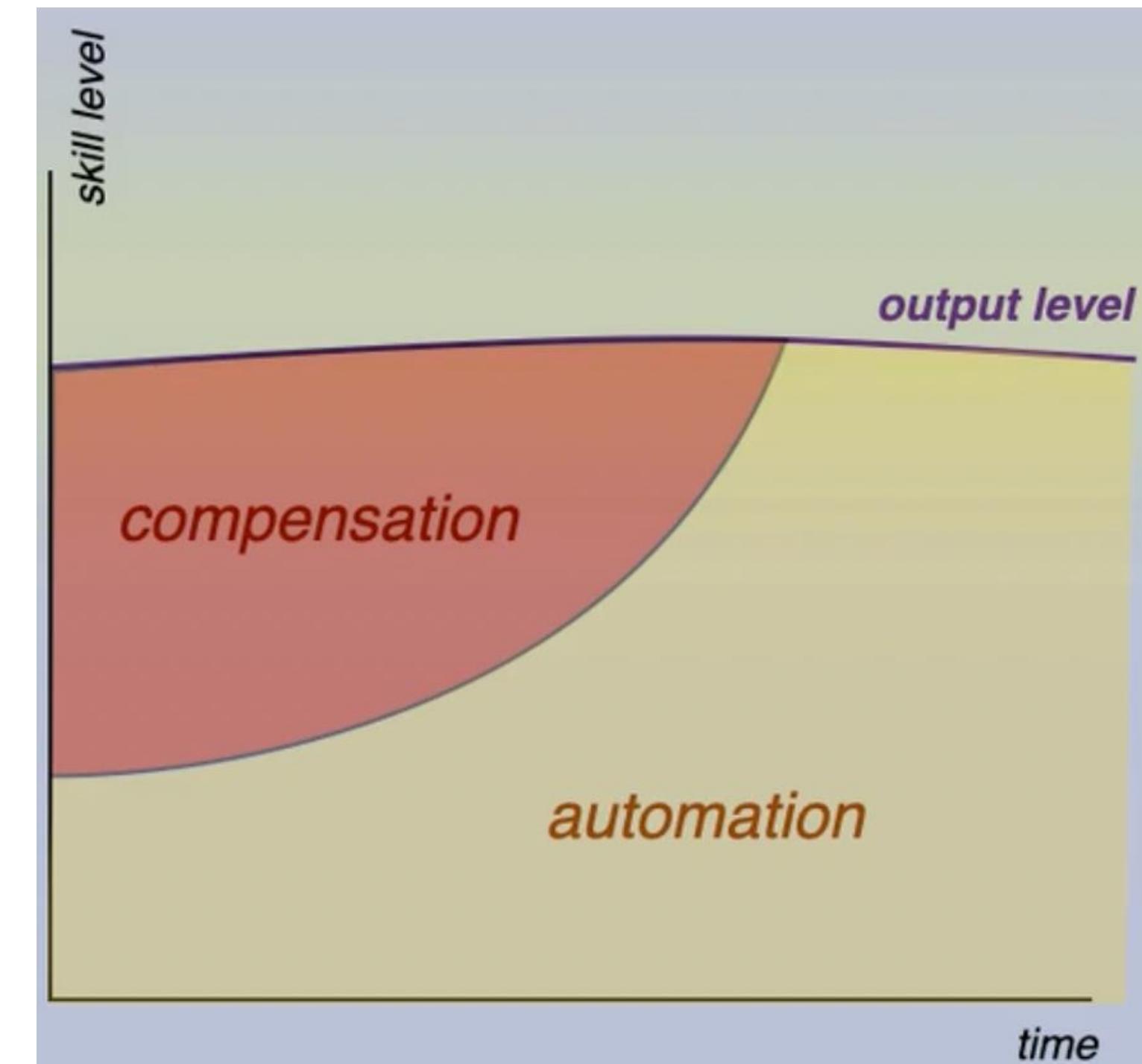


PERCEPCIJSKO-KOGNITIVNA TER MOTORIČNA UREDITEV CŽS

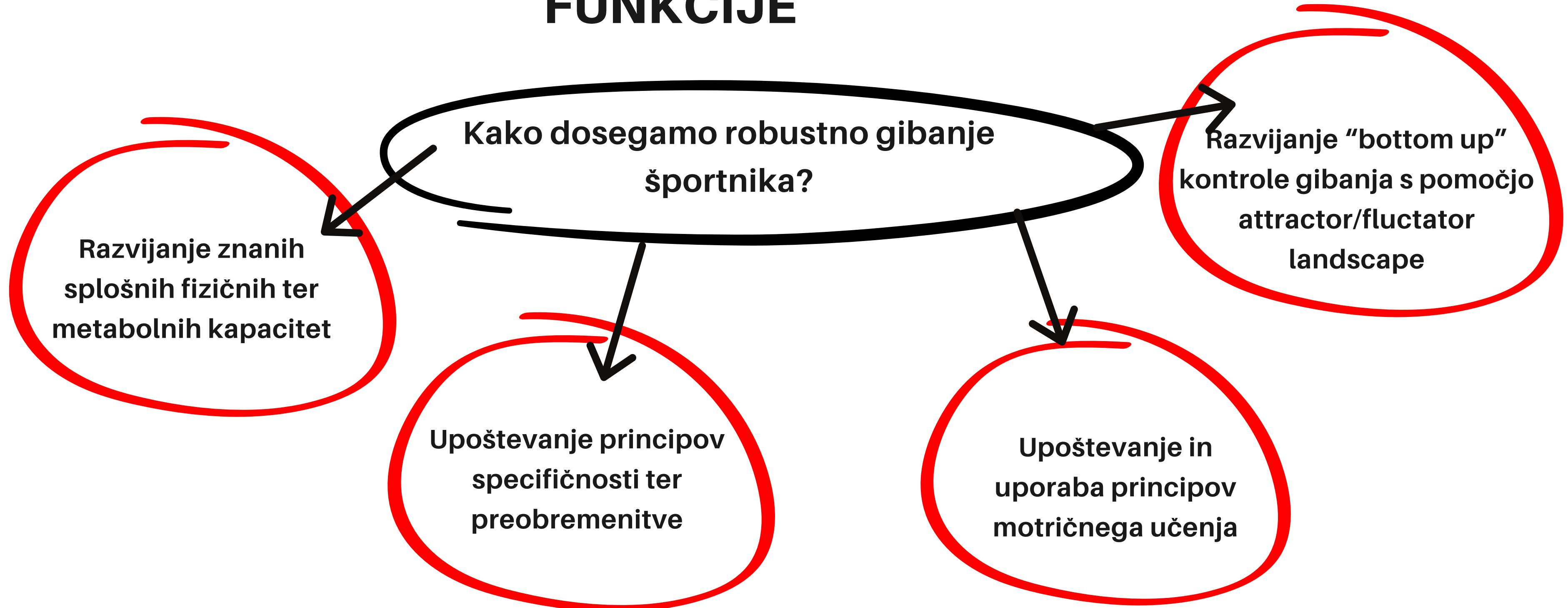
Gibanje je lahko glede na output enako, medtem ko se v CŽS spreminja delež avtomatičnosti in kompenzacij z zavestnim delom kontrole (working memory) (rehab/performance).

Pri manj zahtevnih nalogah, kjer ni pritiskov okolja, naloge, organizma ter ostalih prostorsko - časovnih omejitev tak način kontrole lahko deluje, medtem ko v nasprotnem primeru pride do koordinacijske napake, poškodbe ter zmanjšanja performansa.

Ob vsem tem se nam postavlja vprašanje; na kakšen način lahko gibanje najbolj primerno organiziramo ter učimo?

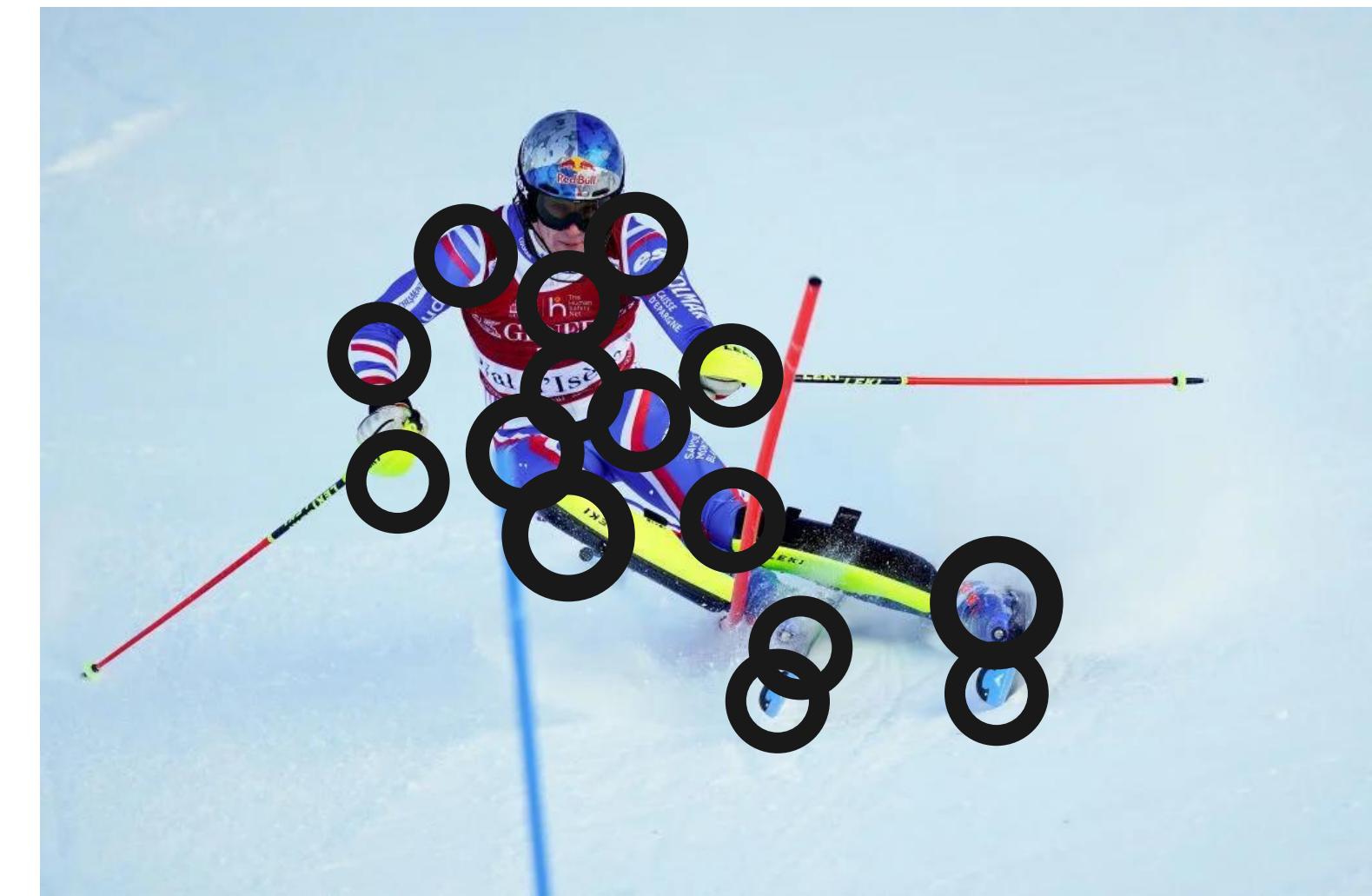
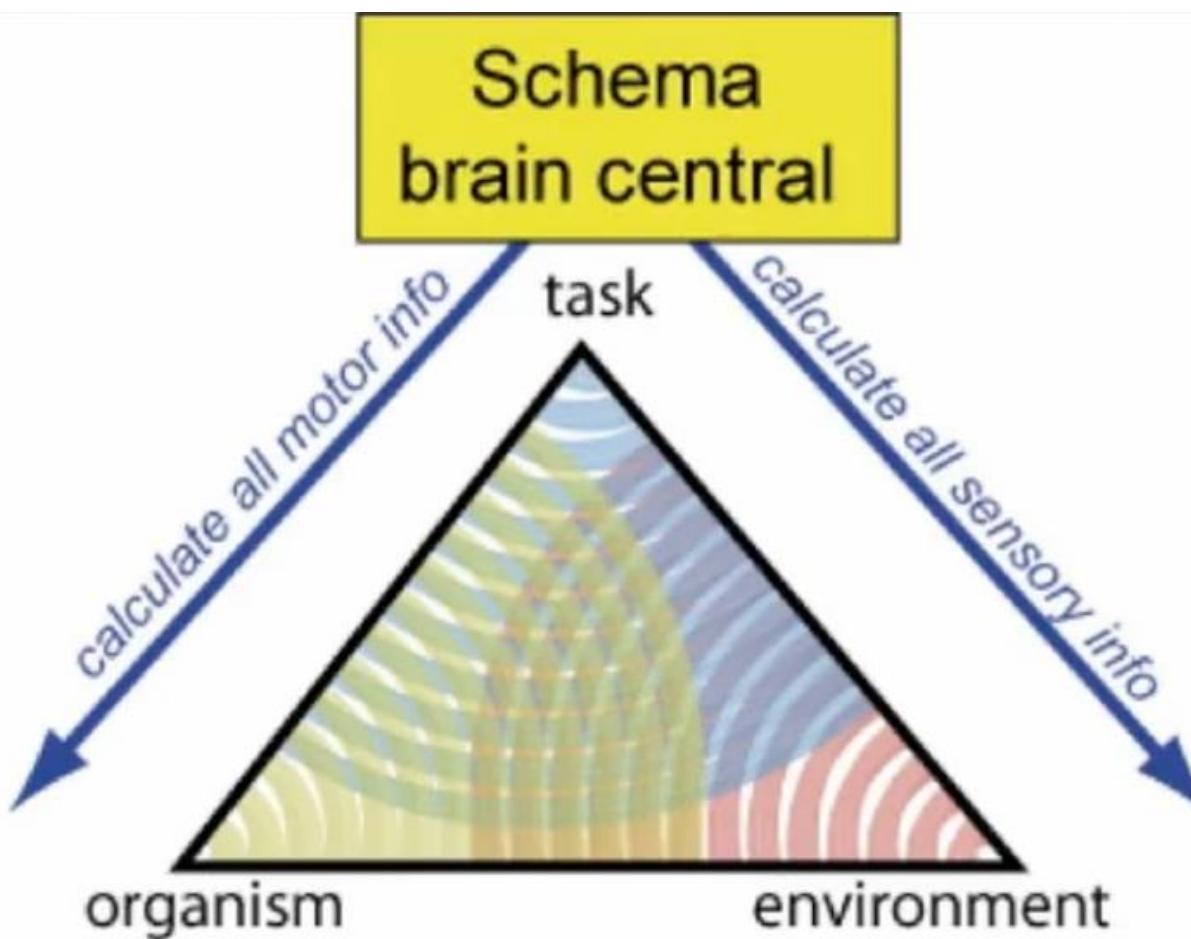


ROBUSTNO GIBANJE KOT PREDPOGOJ ZA RAZBREMENJENE PERCEPCIJSKO-KOGNITIVNE FUNKCIJE



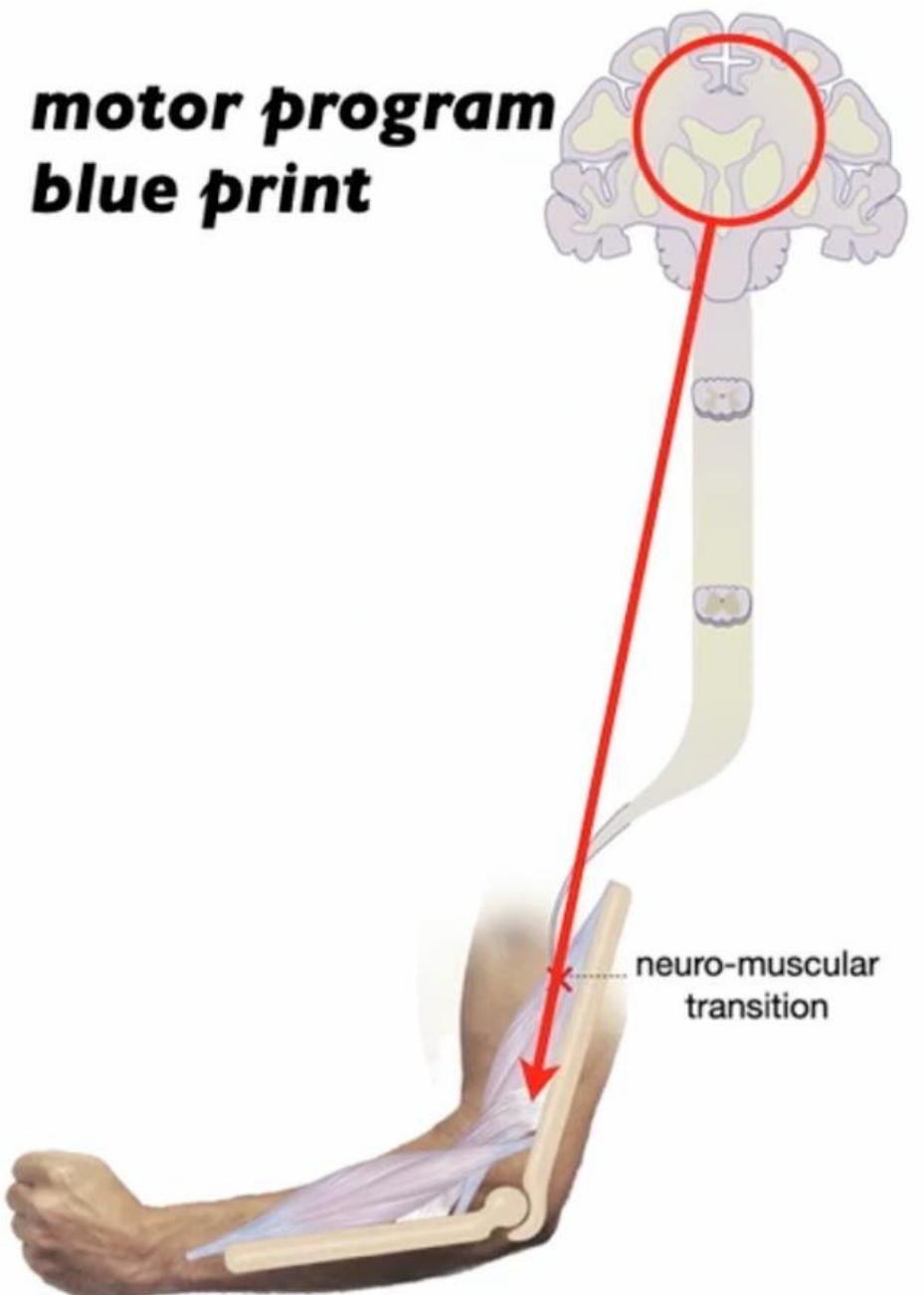
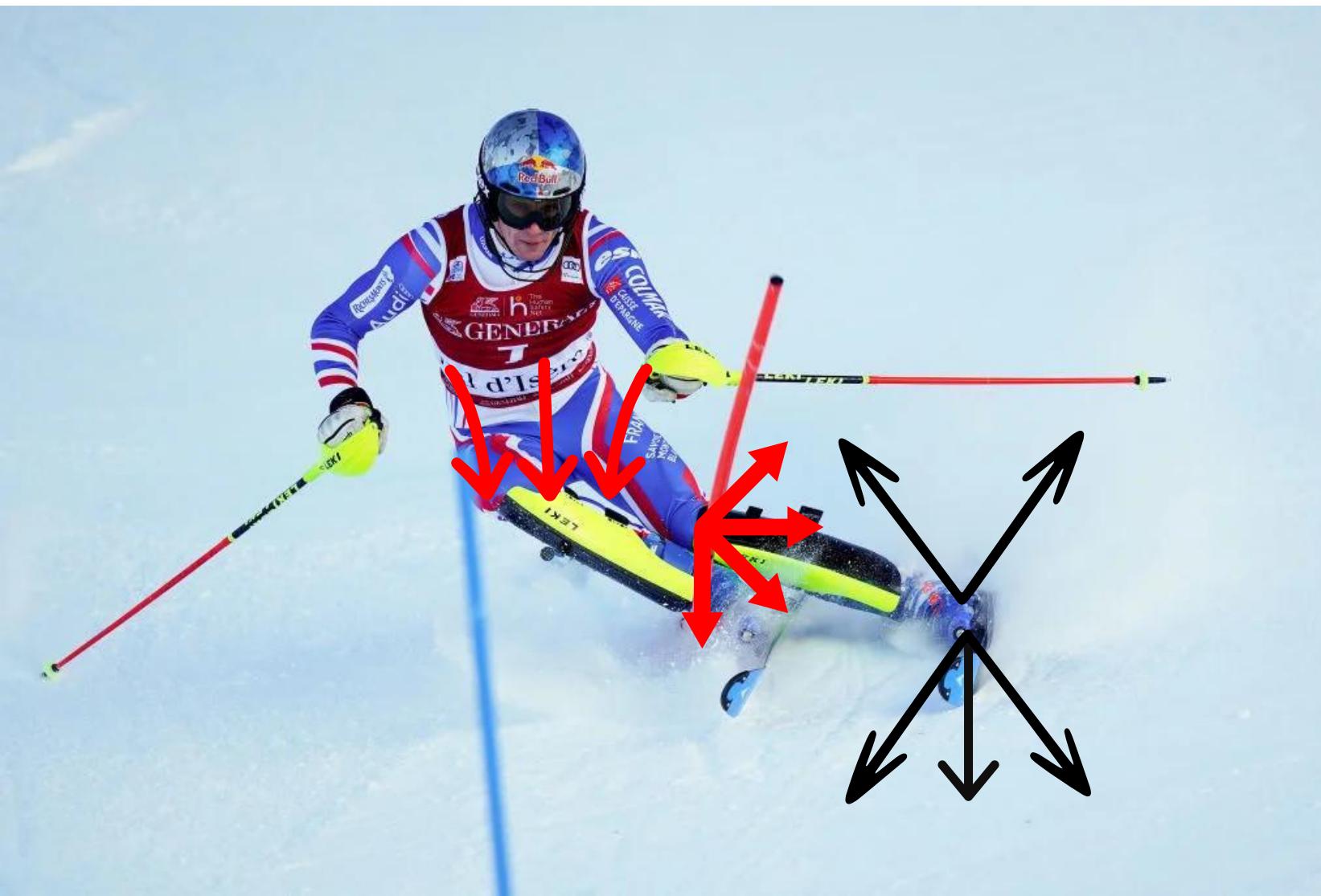
CENTRALNA KONTROLA GIBANJA NE ZADOŠČA ZAHTEVAM ŠPORTA

- Problemi Brain-centered modela, prepogosta uporaba tega modela pri trenerjih, terapevtih.
- Kalkuliranje vseh senzornih/motoričnih informacij med gibanjem.
- Nadzorovanje vseh stopinj gibanja našega organizma (sklepi, mišične sinergije)



CENTRALNA KONTROLA GIBANJA NE ZADOŠČA ZAHTEVAM ŠPORTA

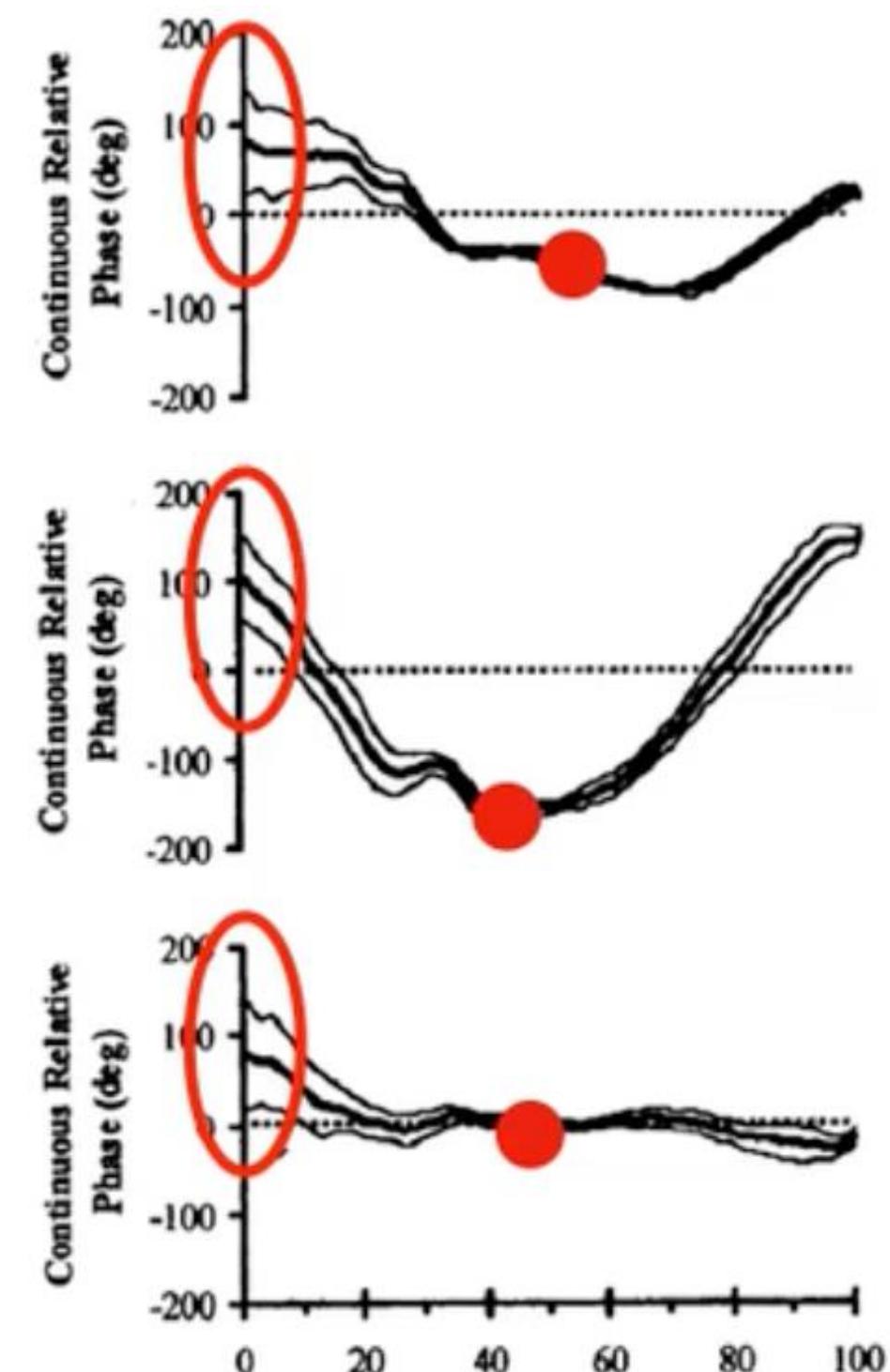
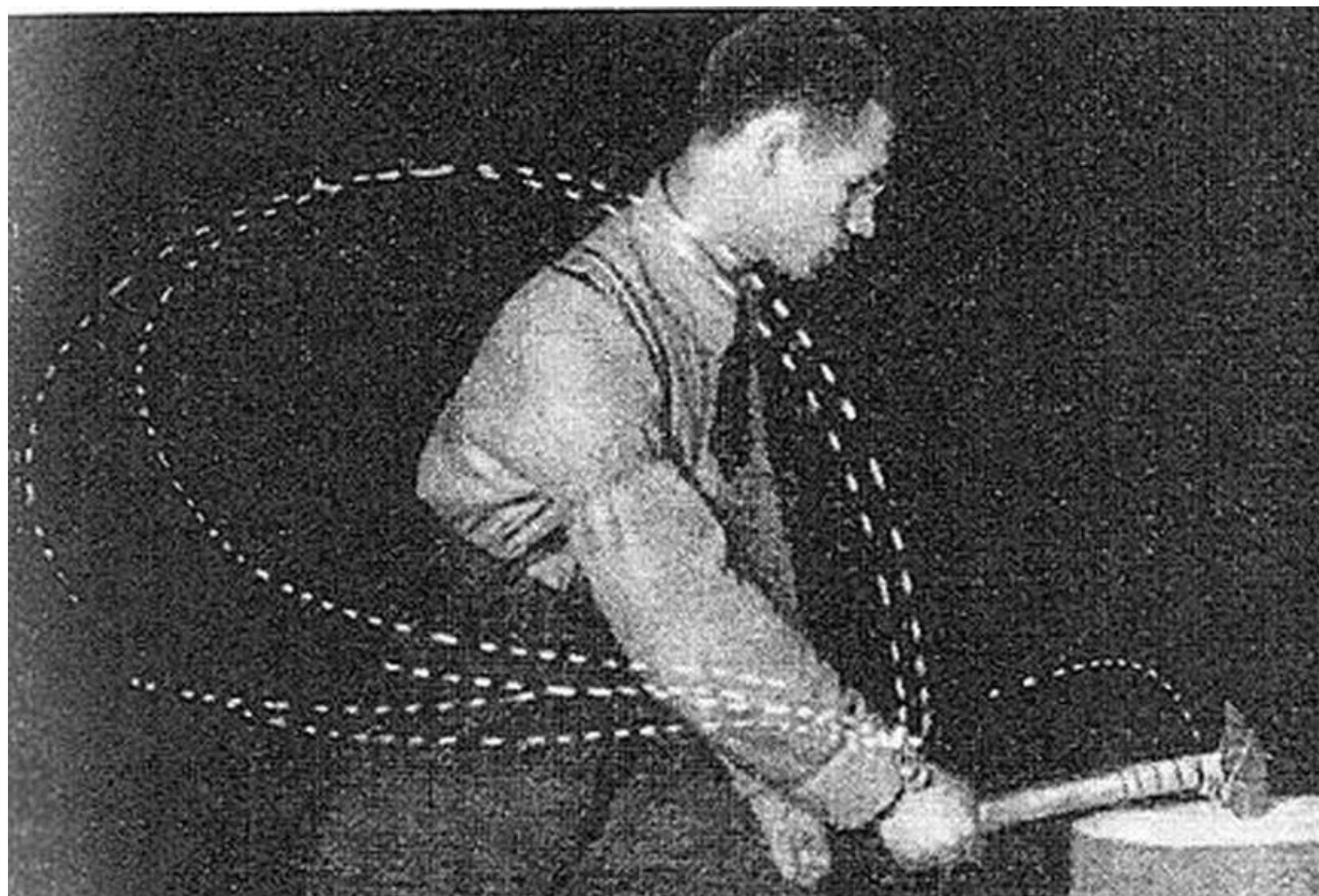
Klasični hierarhični model centralne kontrole gibanja **ne zadošča vsem silam in različnim silam** tal ob gibanju organizma v športu. V primeru hierarhičnosti kontrole mora CNS precizno oceniti vse sile, ki delujejo na telo in vse, ki delujejo znotraj telesa.



CENTRALNA KONTROLA GIBANJA NE ZADOŠČA ZAHTEVAM ŠPORTA

► **Variabilnost gibanja** je pri profesionalnem športu visoka, nobena ponovitev kinetično/kinematično ni enaka!

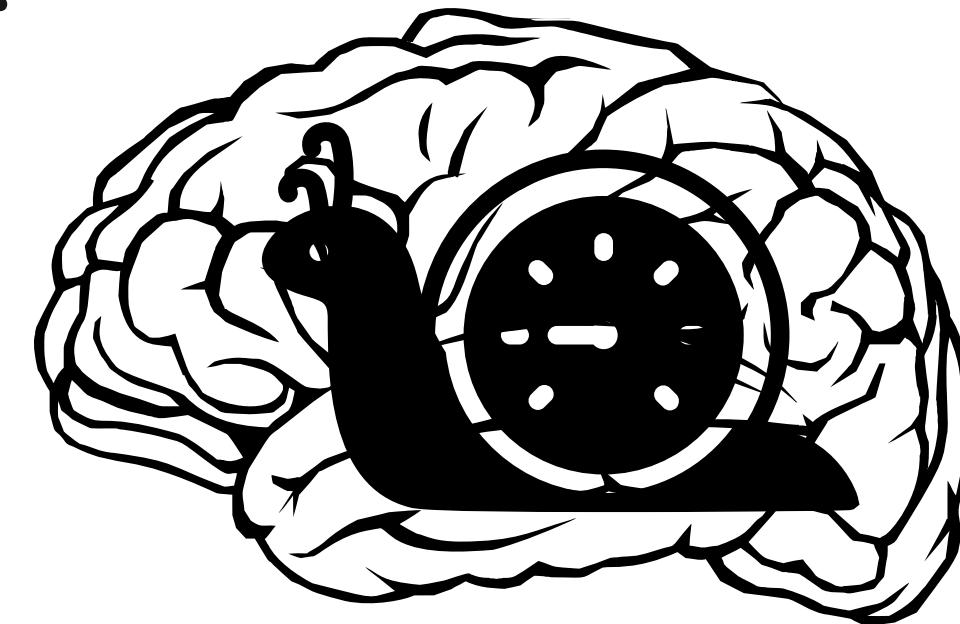
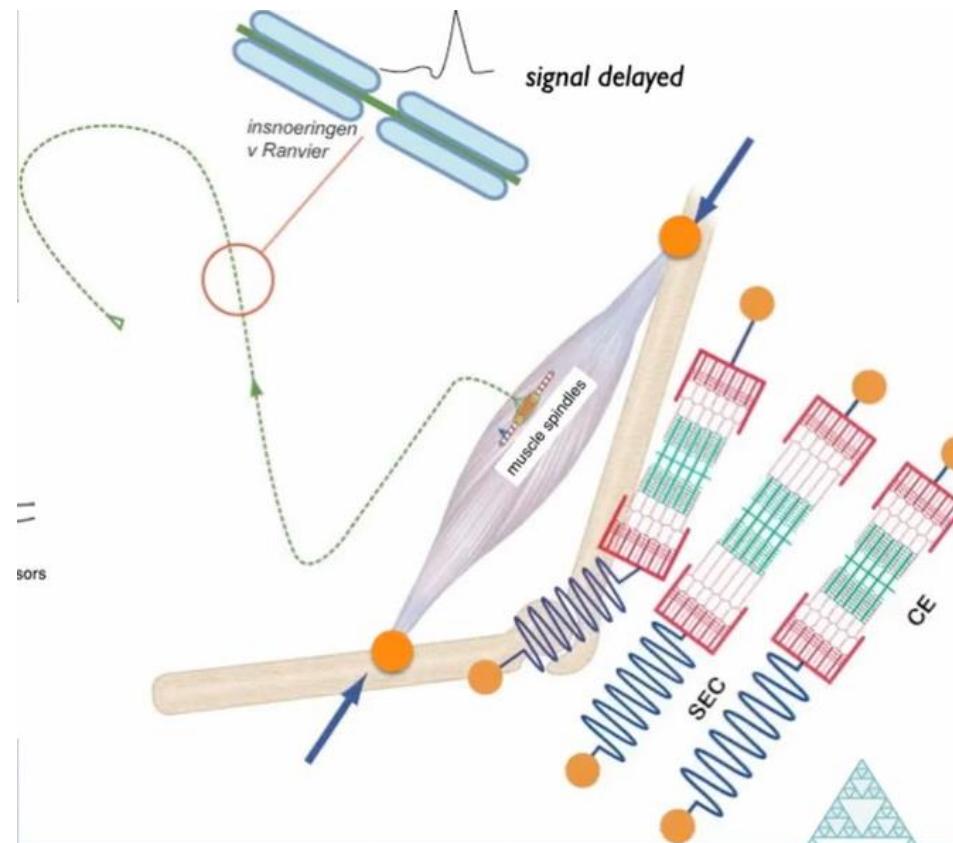
► Z vidika motorične kontrole in brain central model bi morali možgani hraniti vse variacije izvedbe gibalnega problema, to bi vodilo v **procesijsko preobremenitev**.



CENTRALNA KONTROLA GIBANJA NE ZADOŠČA ZAHTEVAM ŠPORTA

Procesiranje CŽS je prepočasno za učinkovito kontroliranje stabilnosti organizma med prostorsko in časovno omejenimi športnimi situacijami!

Najhitrejši refleksni odziv v **50ms+**, odzivi polisinaptičnih zank se gibljejo okrog **150ms**, zavestni kortikalni odziv pa **500ms** - simply too slow for sporting movements.

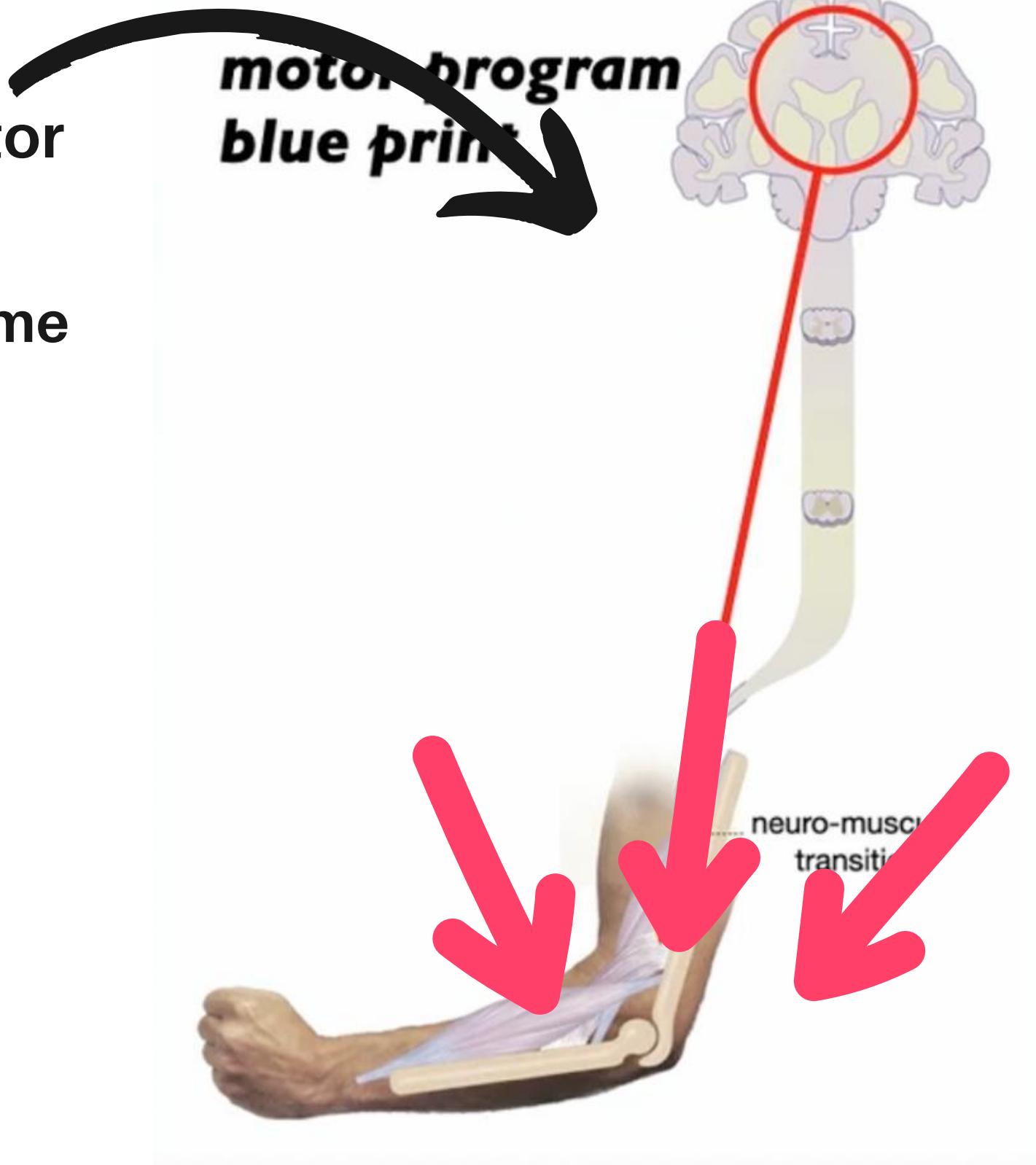


CENTRALNA KONTROLA GIBANJA NE ZADOŠČA ZAHTEVAM ŠPORTA

The bigger the signal the more shaky the motor program is!

Prav zaradi tega potrebujemo periferne mehanizme kontrole gibanja.

Problematika generaliziranosti gibanja v različin kontekstih športa.



CENTRALNA KONTROLA GIBANJA NE ZADOŠČA ZAHTEVAM ŠPORTA

- Okay so what? What are the implications?
- 85-90% trenerjev uporablja zunanje usmerjeno pozornost in precizna navodila pri učenju veščin ali tehnike.
- Program treningov fizične priprave vse prepogosto ločuje aspekte trenažnega procesa (moč, agilnost, hitrost...)

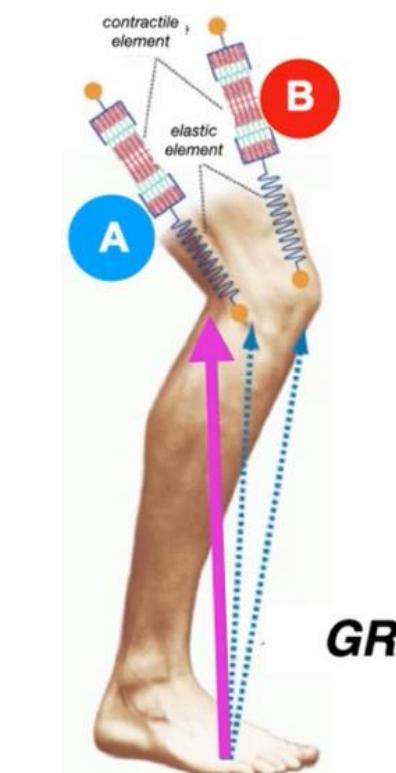
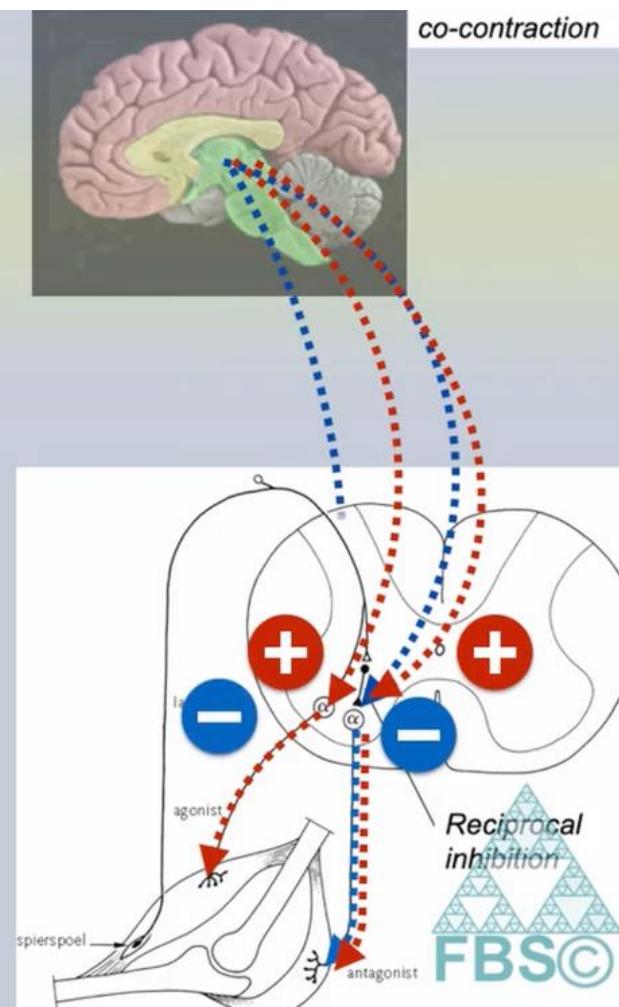
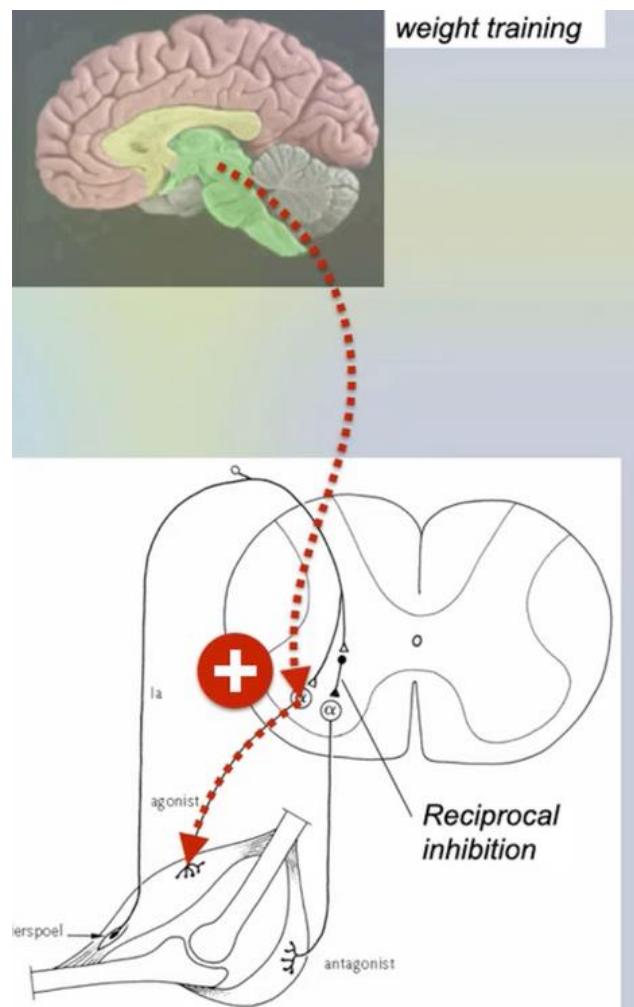


VS

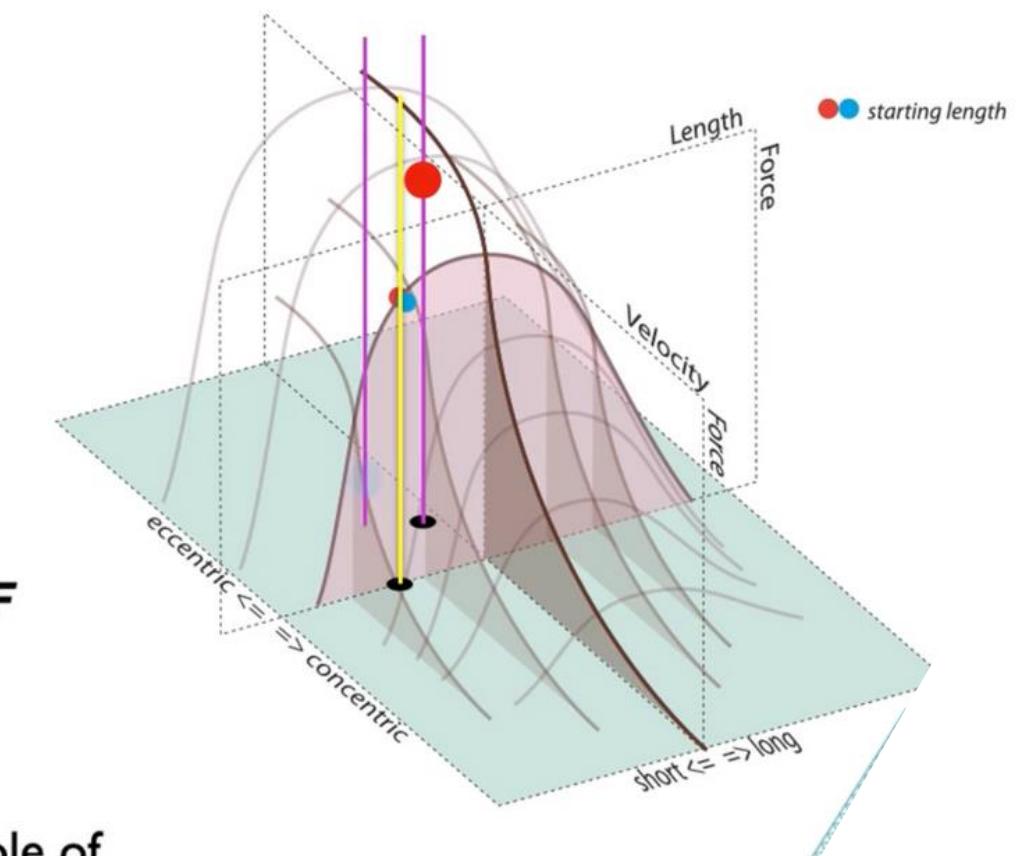


SAMO-ORGANIZACIJA GIBANJA

- Pre-flexi in mišična kokontrakcija omogočajo **takojšnjo adaptacijo na perturbacije okolja** (**večji efferentni signal!**)
- Za trening kokontrakcij potrebujemo drugačno obliko treninga, **potreben je izjemno velik output motoričnega sistema! 3Ps**

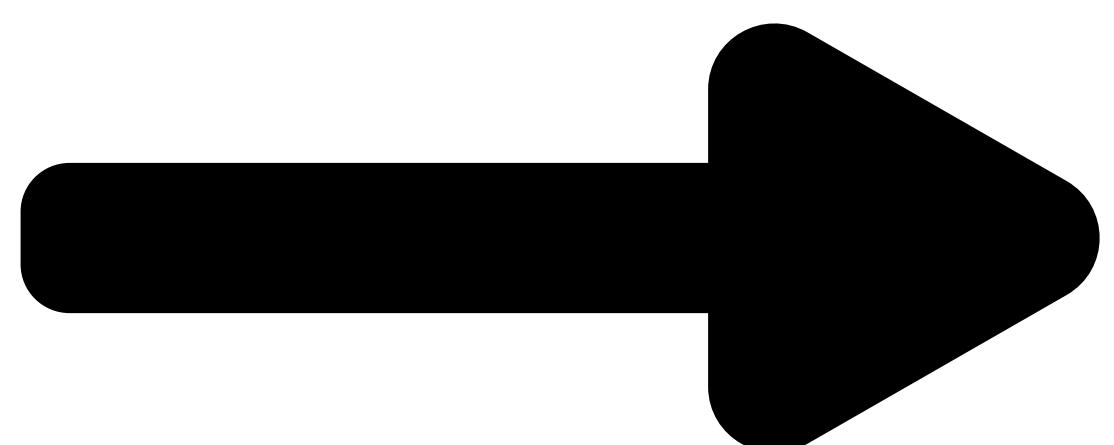
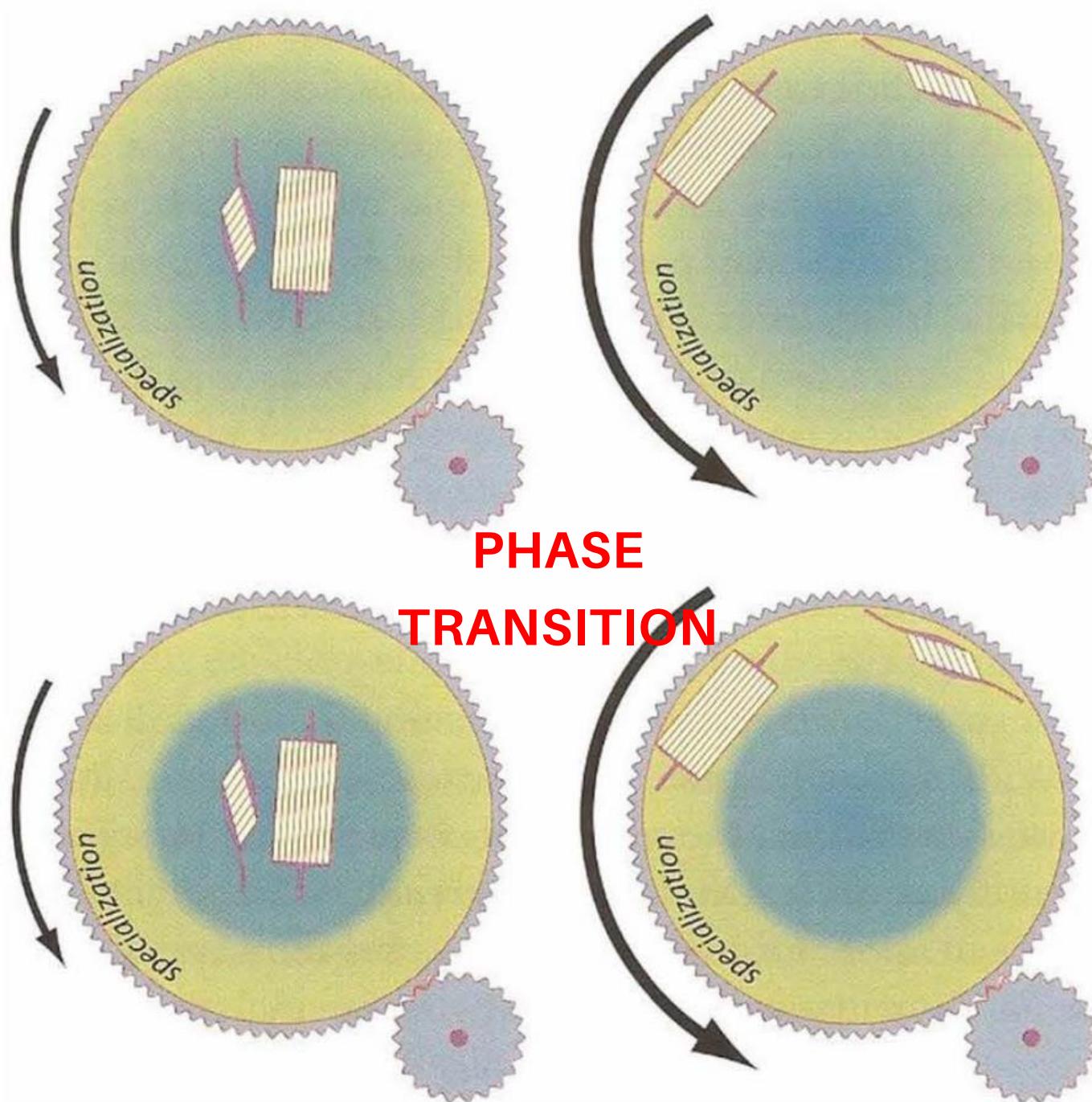


preflexes, the role of cocontractions

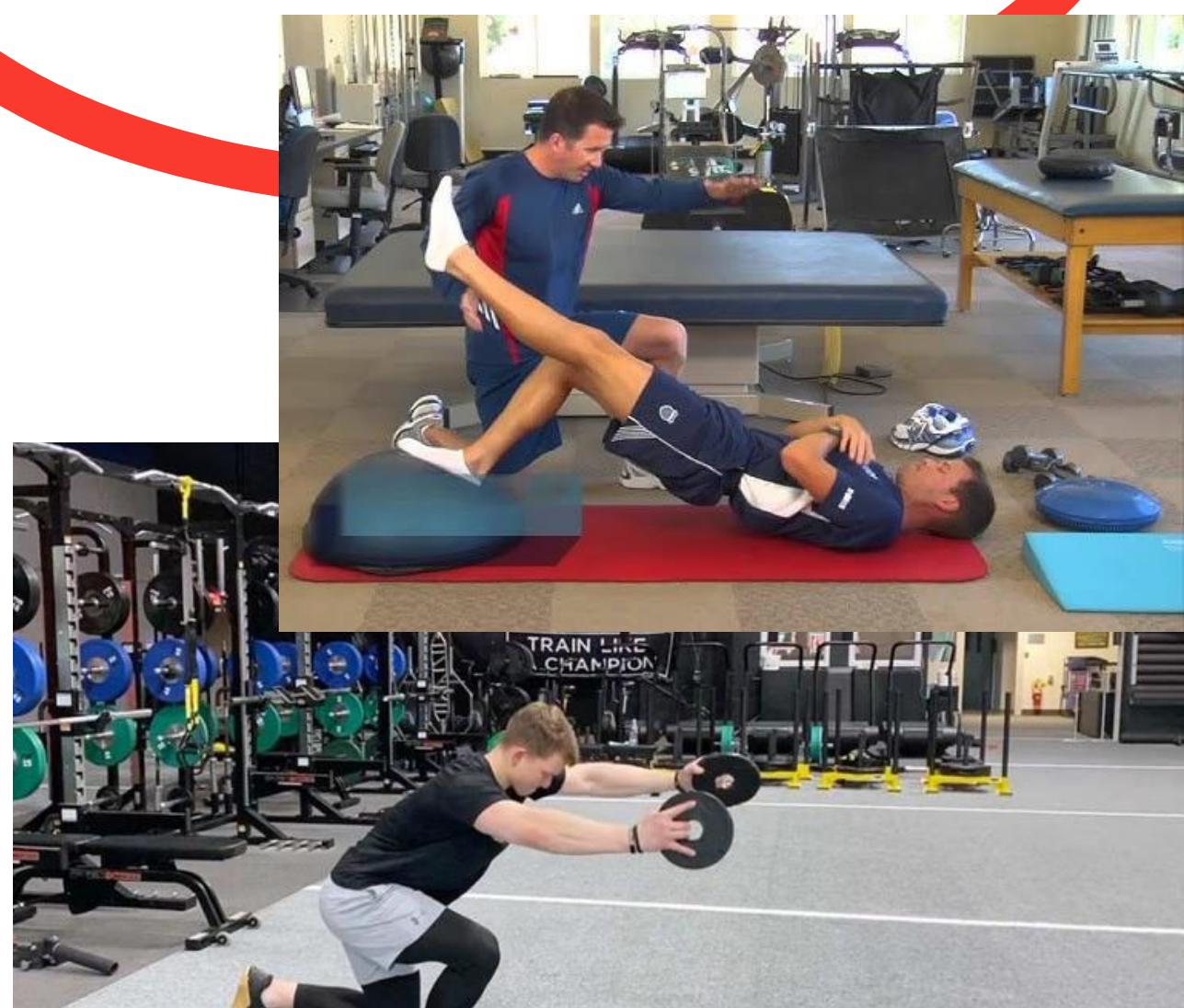


SAMO-ORGANIZACIJA GIBANJA

Muscle centrifuge model!

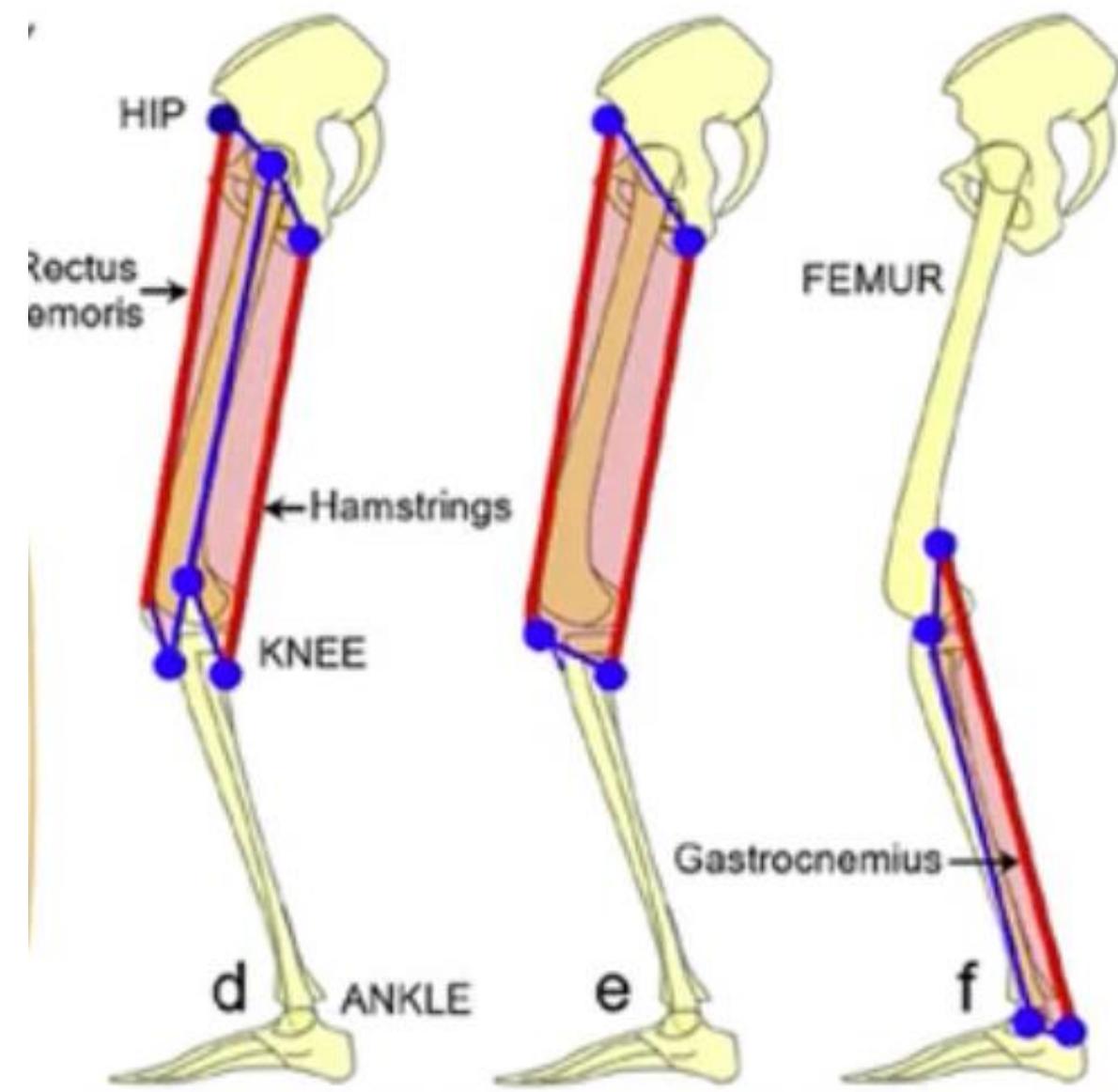


ANY TRANSFER TO SPORT
SPECIFIC SITUATIONS?



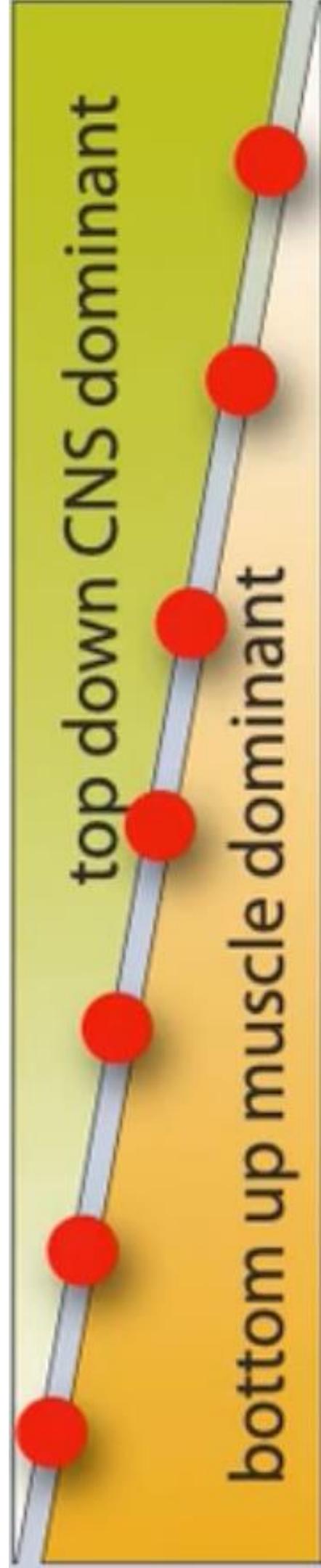
SAMO-ORGANIZACIJA GIBANJA

- **4 bar system** - primer optimalne in dokaj isometrične kontrakcije mišic, omogoči določene gibe ostale pa prepreči, s tem vzpostavi dobro stabilnost ter kontrolira proste stopinje gibanja.



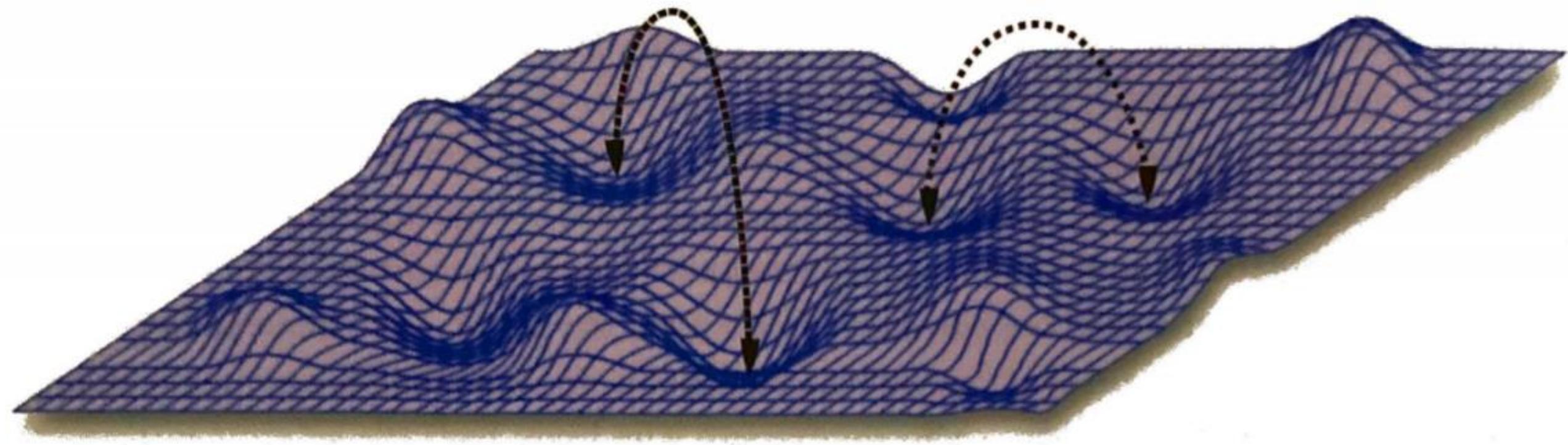
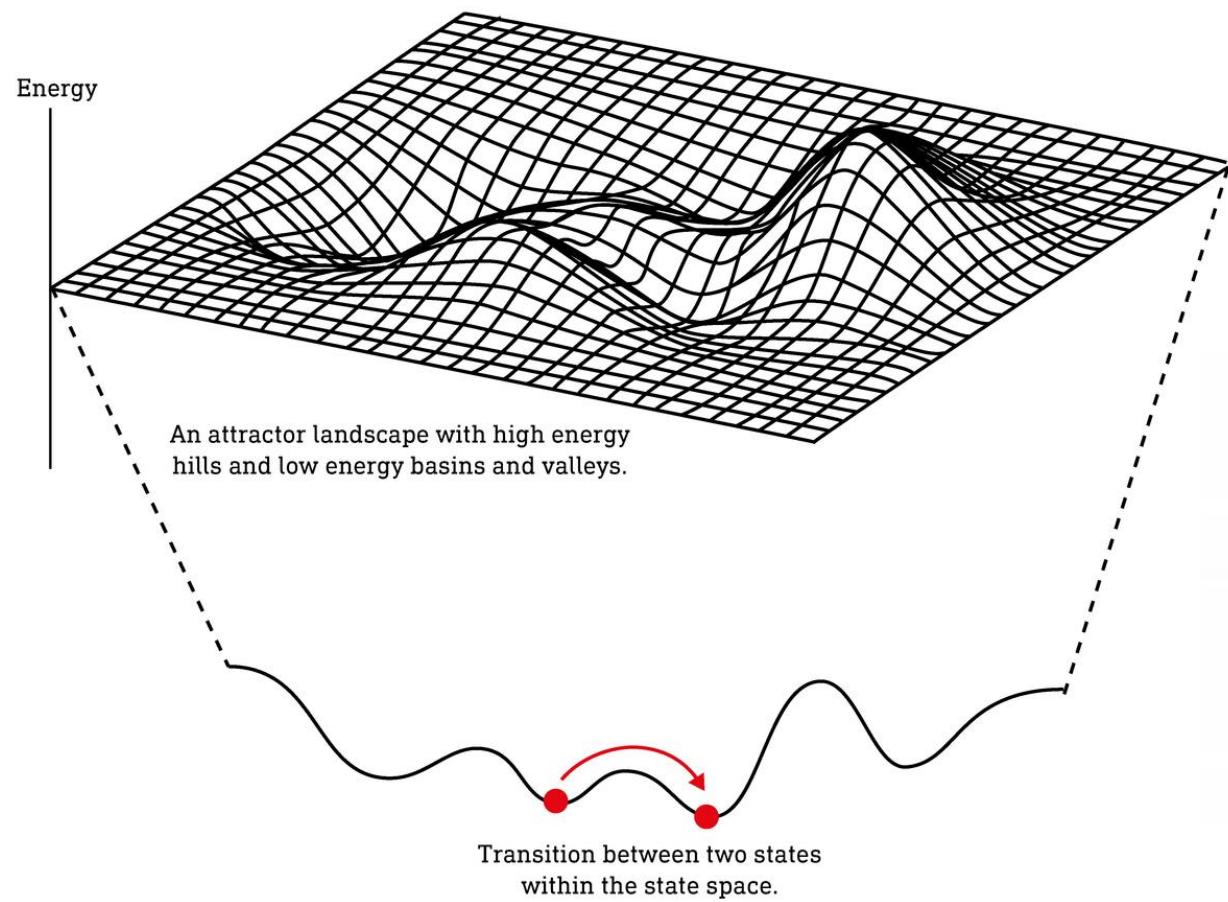
- Vse naštete oblike samo-organizacije potrebujejo **minimalno procesiranje CNS** ter posledično omogočajo takojšnjo kontrolo gibanja, brez zamud, ki se zgodijo pri **Brain central model control**.

- Pri analizi najvišje intenzivnosti alpskega smučanja vedno opazimo **stabilne komponente gibanja**, ti so posledica integracije **bottom up/top down control**.



RAZPOREDITEV ATRAKTORJEV IN FLUKTUATORJEV

- Verjetno najpomembnejša “bottom up” strategija kontrole gibanja je organizacija atraktorjev ter fluktuatorjev.
- Visoka intenziteta športnega gibanja zahteva kontrolo “degrees of freedom” kar omogočajo atraktorji
 - Atraktorji kot stabilna komponenta, ki se ne spreminja, je izredno učinkovita (porabi malo energije) in je odporna na kaotično okolje.
 - Fluktuatorji so variabilne komponente gibanja, ki omogočajo prilagoditve kontekstualnemu okolju (notranja smučka/noga pri zavoju)



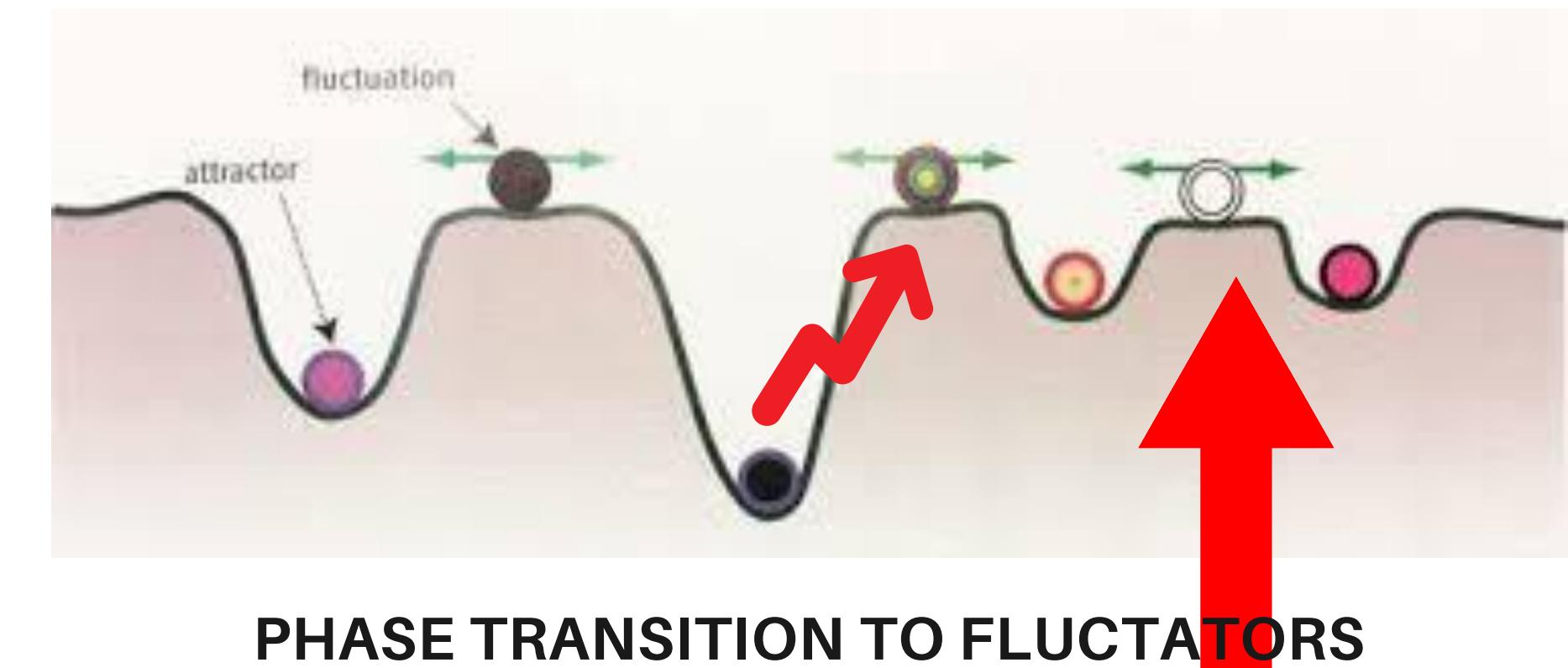
RAZPOREDITEV ATRAKTORJEV IN FLUKTUATORJEV

- Primer atraktorjev pri smučanju: hip lock, knee cocontraction, core cocontraction, ankle stiffness..

- Izguba stanja atraktorjev povzroči tranzicijo (phase transition) v fluktuatorje kar lahko povzroči poškodbo

ATTRACTORS IN

PLACE



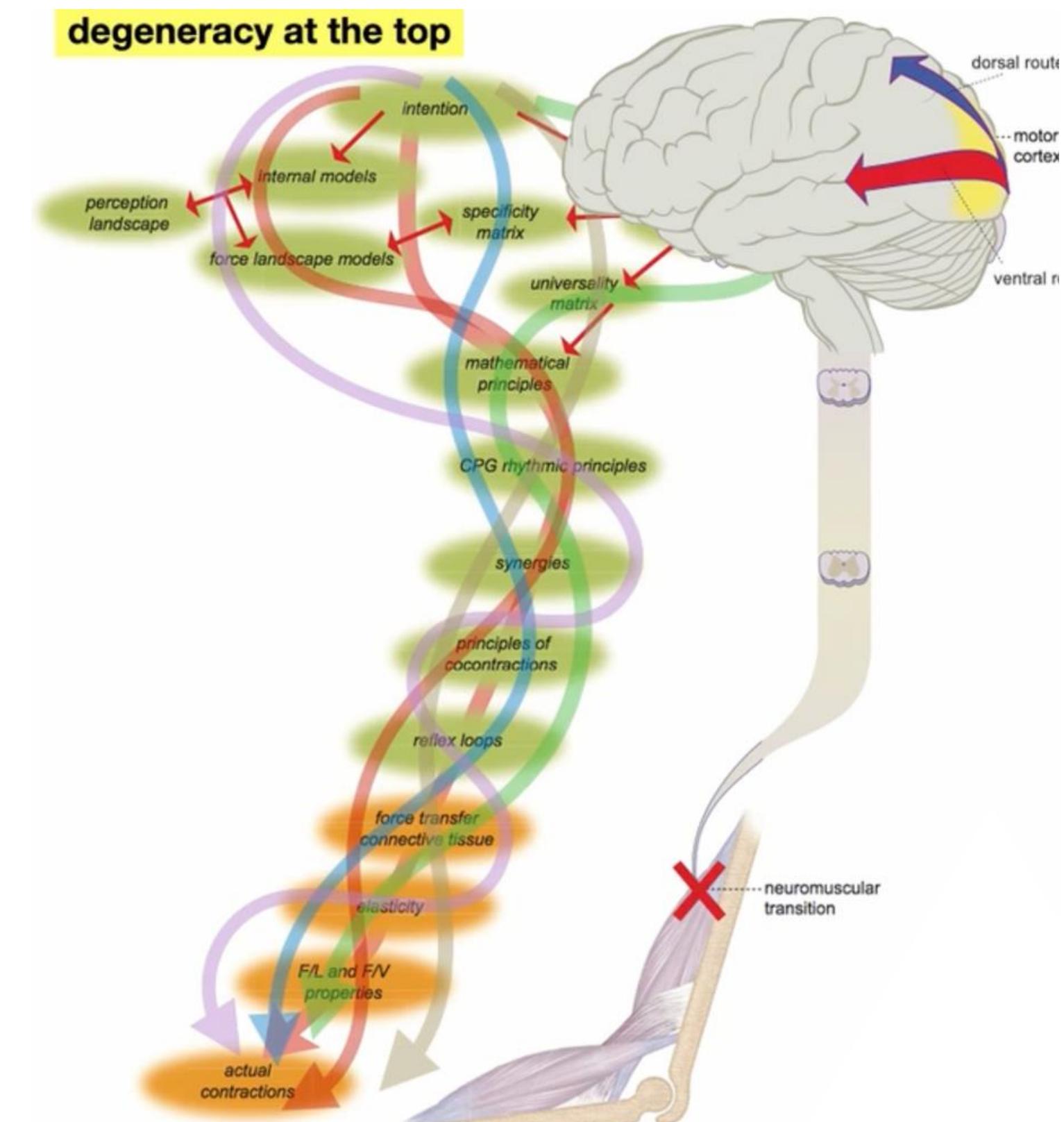
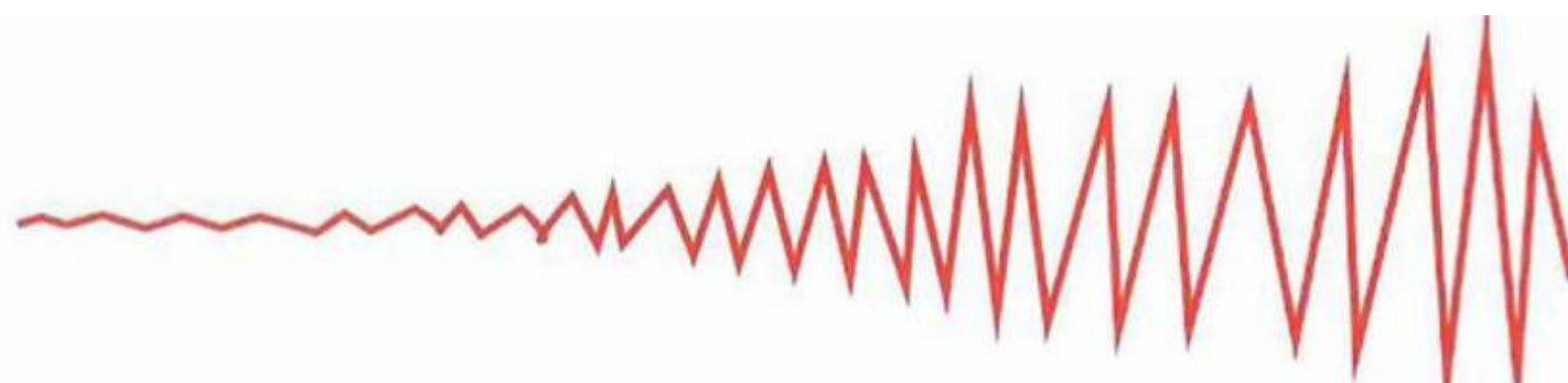
VLOGA MOŽGANOV: INTENTION TO ACTION

Možgani nikoli ne generirajo točnih motoričnih ukazov.

Ustvarjajo namen in abstraktna pravila.

Namen in abstraktna pravila **določajo stanja in situacijo organizma, ko je akcija zaključena (end point), (preskoči oviro, uravnotežen zaključek zavoja!)**

Abstraktna pravila se naprej **integrirajo v široko mišično kooperacijo - na koncu se določi specifična mišična aktivacija (velika variabilnosti!!)**

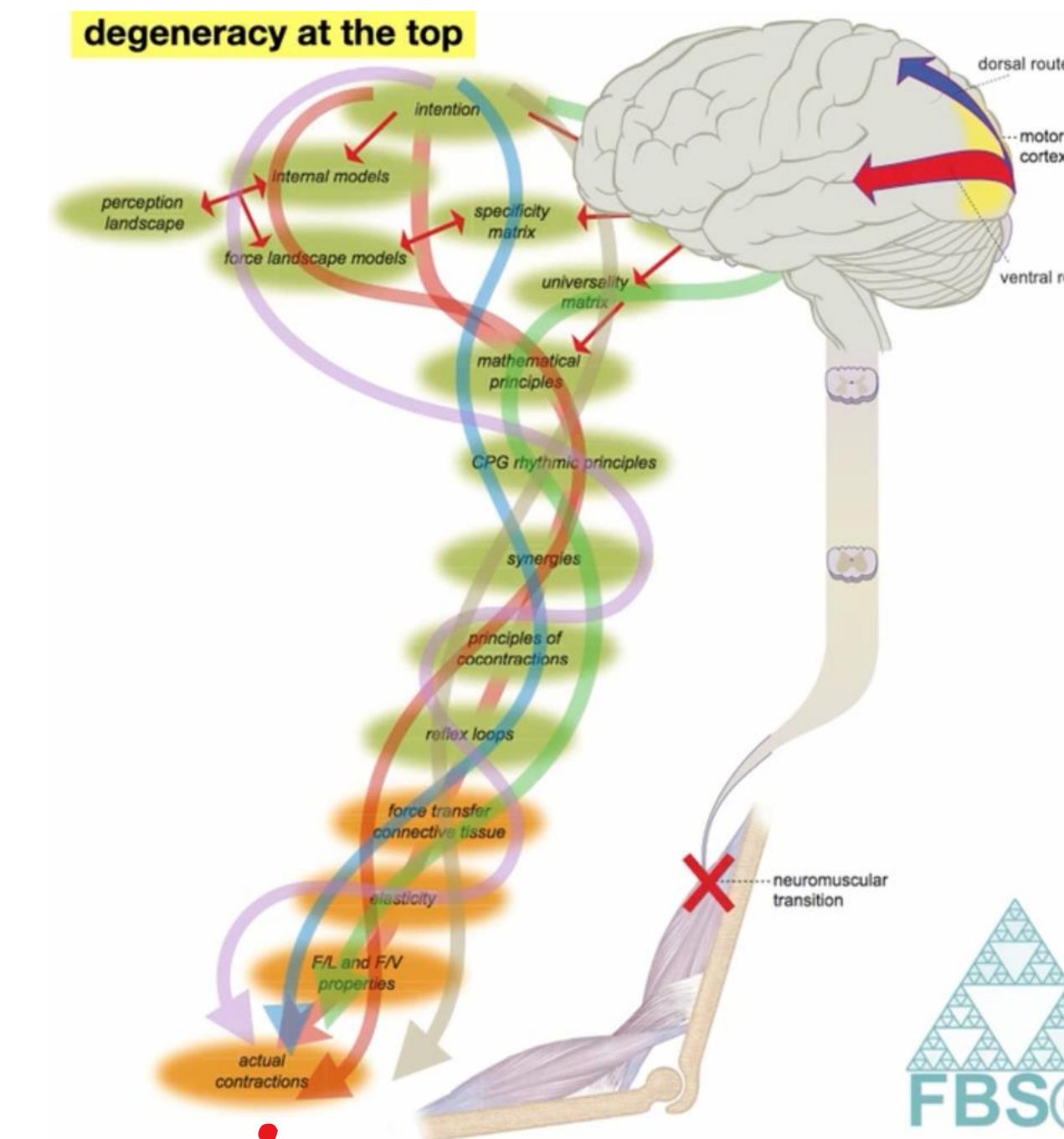


Especially important for open skills!!

VLOGA MOŽGANOV: INTENTION TO ACTION

Ta organizacija omogoča **mnogo načinov kontrole določenega gibanja (end point)**, kar je nujno za prilagajanje kaotičnemu okolju.

Temu primerno so **potrebne prilagoditve naših treningov** tako v offseasu kot tudi na terenu (variabilnost).





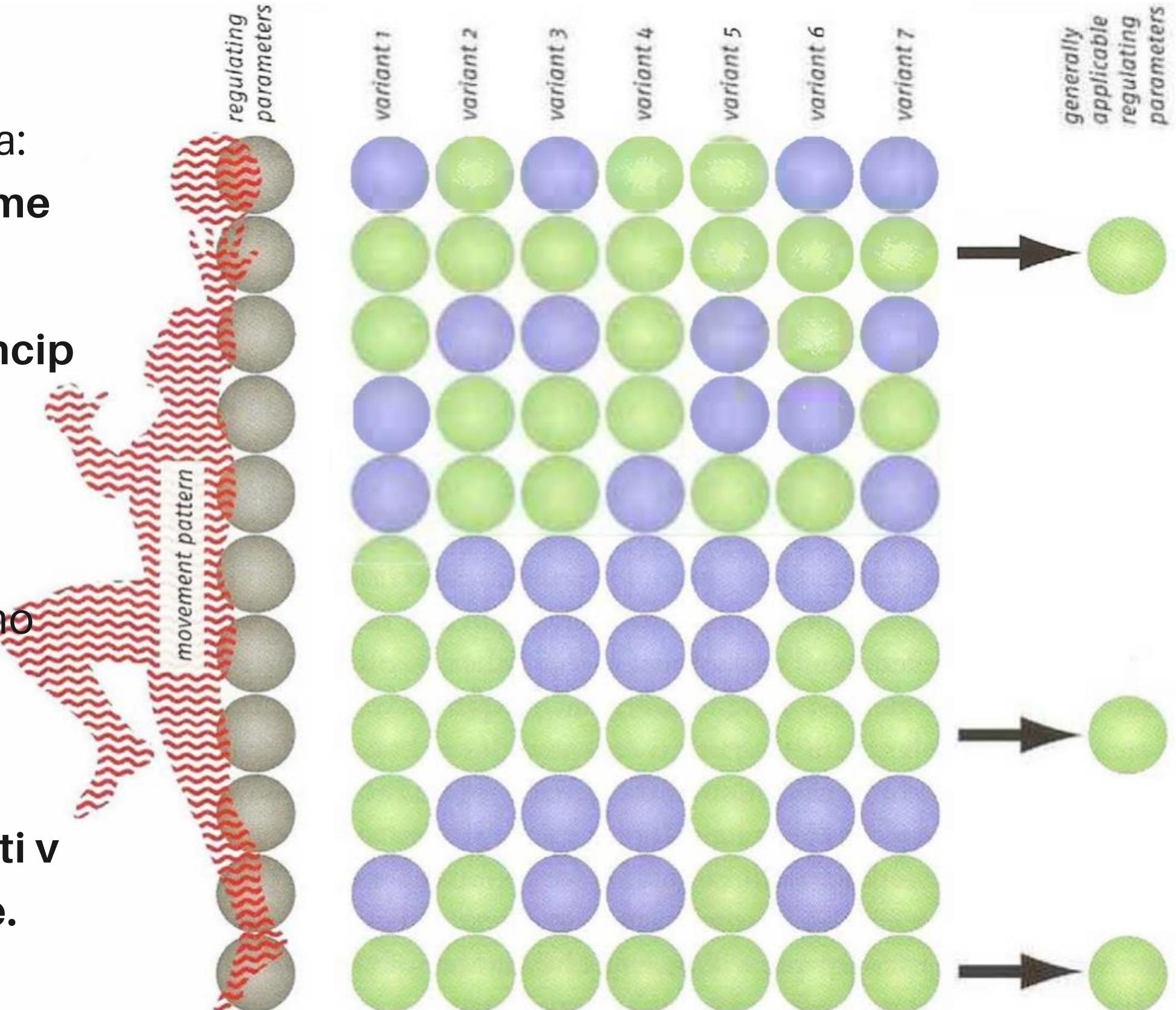
VARIABILNOST IN PRAVILA GENERALIZACIJE

- Pri open skill športih imajo možgani dva problema:
storage problem ter retrieval problem (under time pressure)

- Zato naši možgani shranjujejo gibanje glede na **princip univerzalnosti**.

- S tem možgani zmanjšajo zbirko različnih **incidenčnih motoričnih kontrol** in shranjujejo samo tiste, ki so robustni in univerzalni v vseh kaotičnih športnih situacijah.

- Zato precizno učenje in pomanjkanje variabilnosti v trenažnem procesu ne vodi v optimalno učenje.



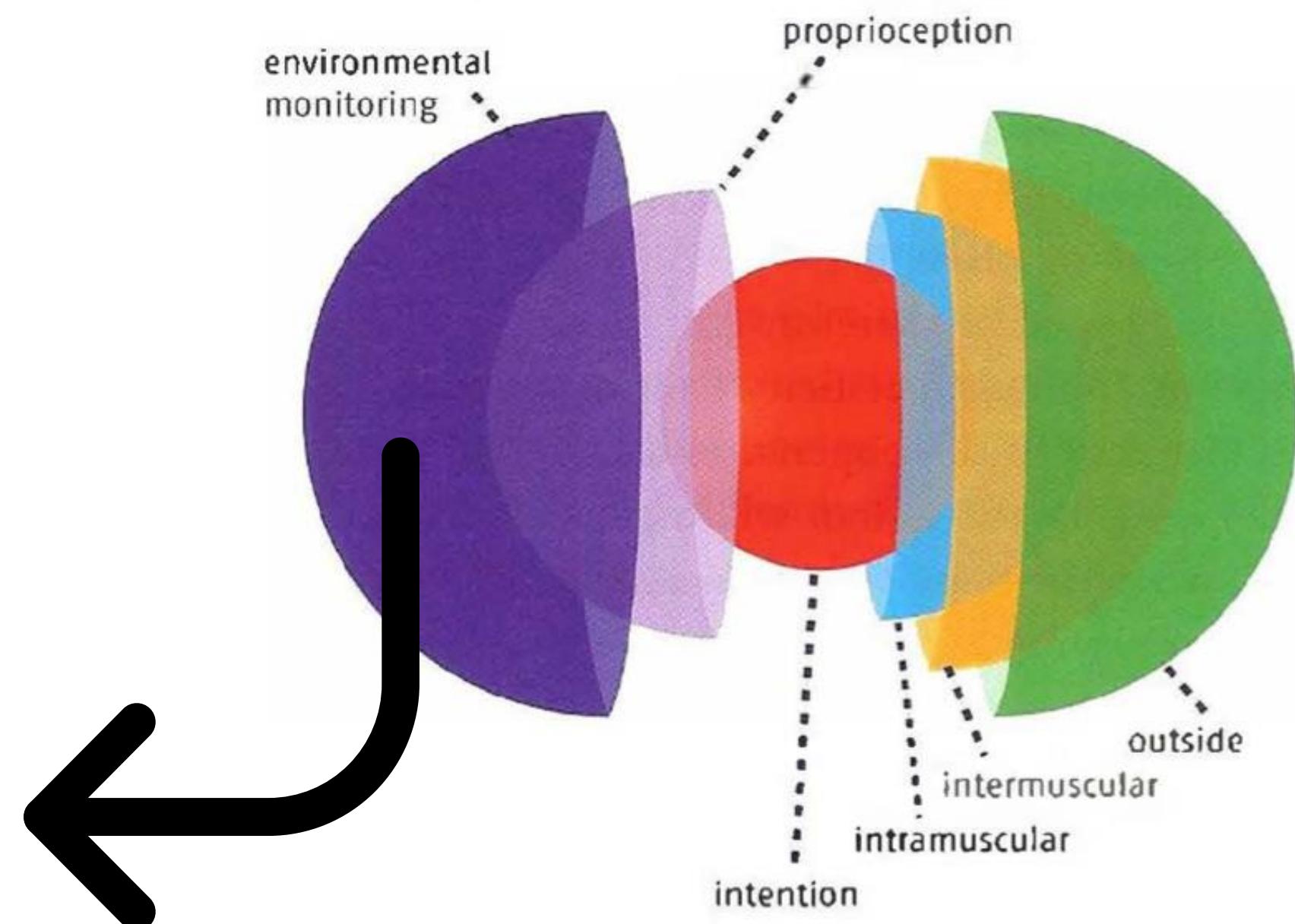
ISKANJE UNIVERZALNIH GIBALNIH POVEZAV

Možganom so zanimivi gibi, **ki so univerzalno uporabni**. Podobnost med posameznimi gibi in gibalnimi komponentami **organizem išče s Filtrom specifičnosti**

Dominant control strategy: kater nivo CNS je dominanten pri kontroli določenega giba.

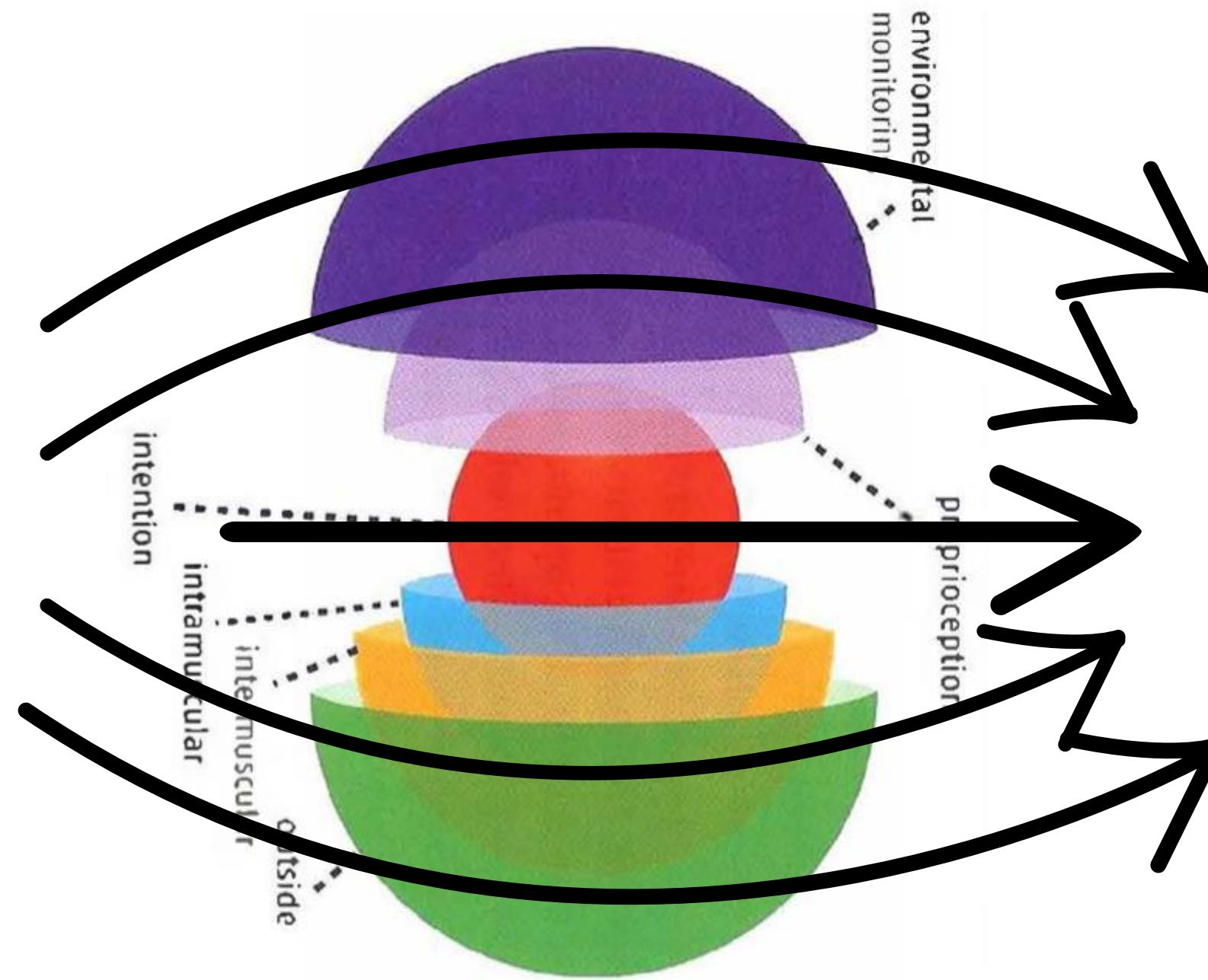
Pomanjkanje univerzalnosti/generalnosti onemogoča dolgoročno učenje motoričnih veščin, ki so odporne na perturbacije okolja, naloge in organizma.

DODATNO SITO = DOMINANT CONTROL STRATEGY



ISKANJE UNIVERZALNIH GIBALNIH POVEZAV

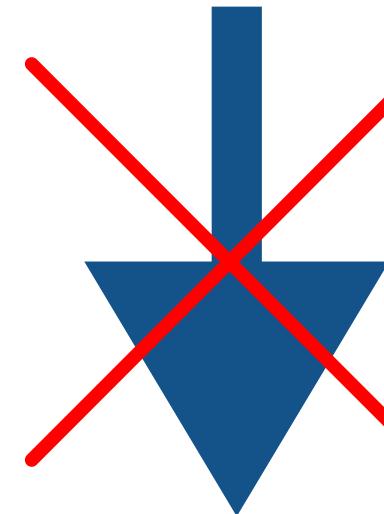
HOW MUCH TRANSFER?



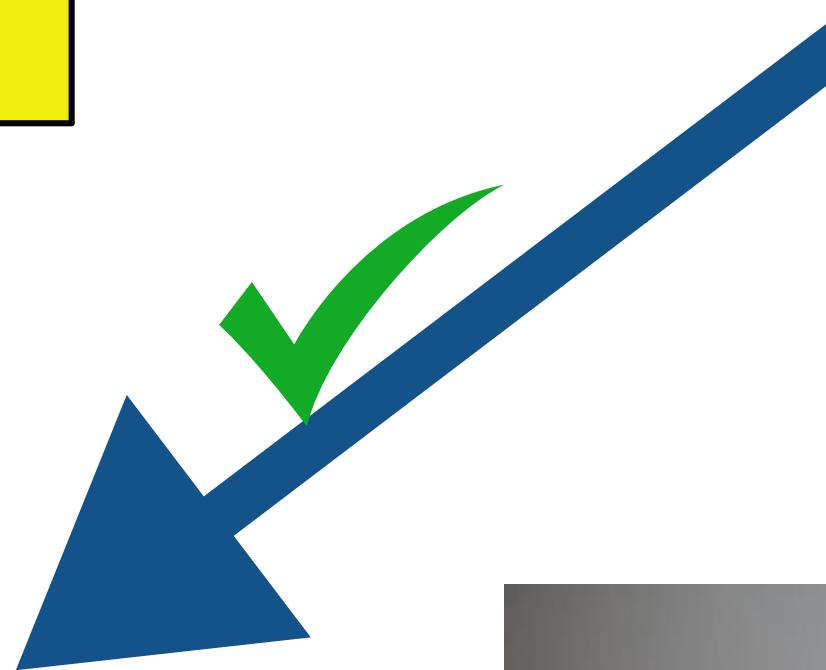
ISKANJE UNIVERZALNIH GIBALNIH POVEZAV

Specificity as requirement for
transfer

ZAVESTNA KONTROLA
“DELAVNI SPOMIN”

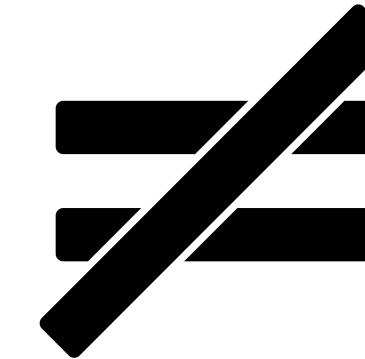


AVTOMATSKA
“PODZAVESTNA
KONTROLA”
“HARD DRIVE”



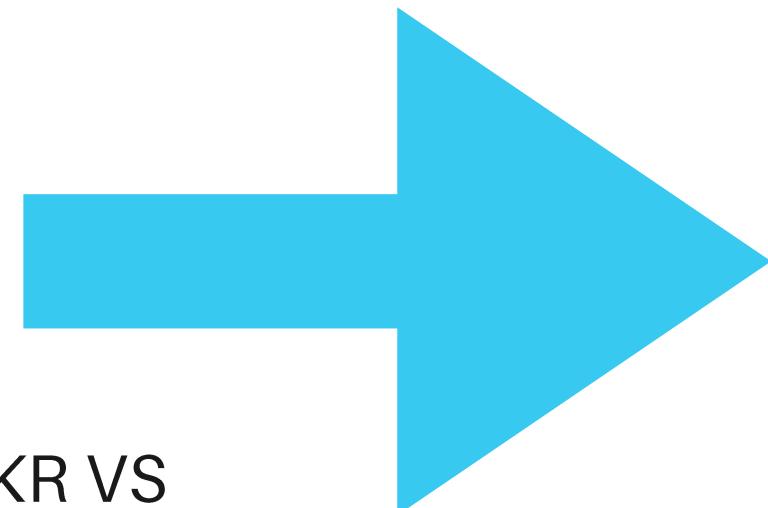
ZAVESTNA KONTROLA
(INTERNAL CUES, VERBAL
LEARNING)

PODZAVESTNA KONTROLA
(IMPLICIT LEARNING)

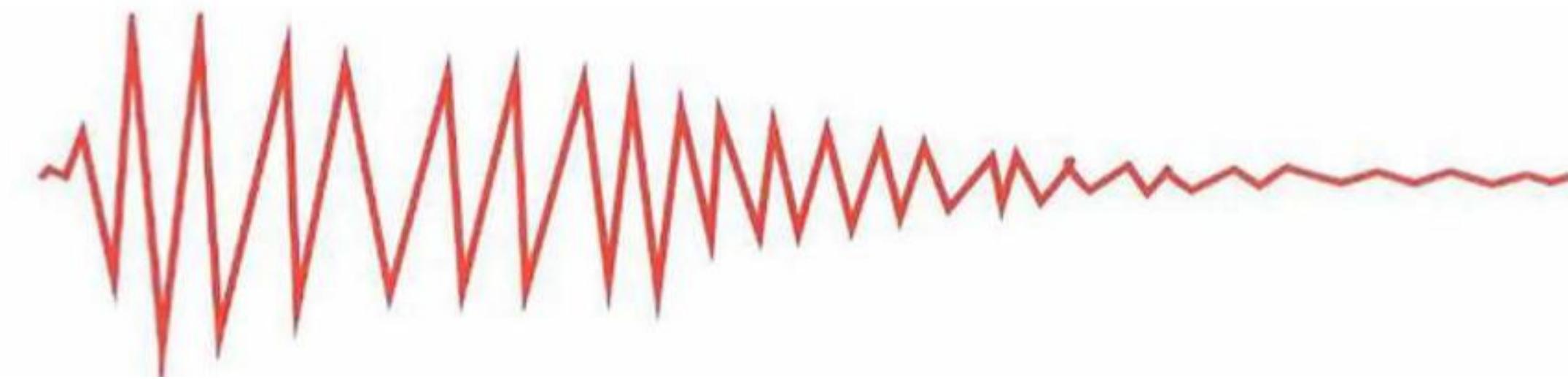


“TOOLBOX” MOTORIČNEGA UČENJA

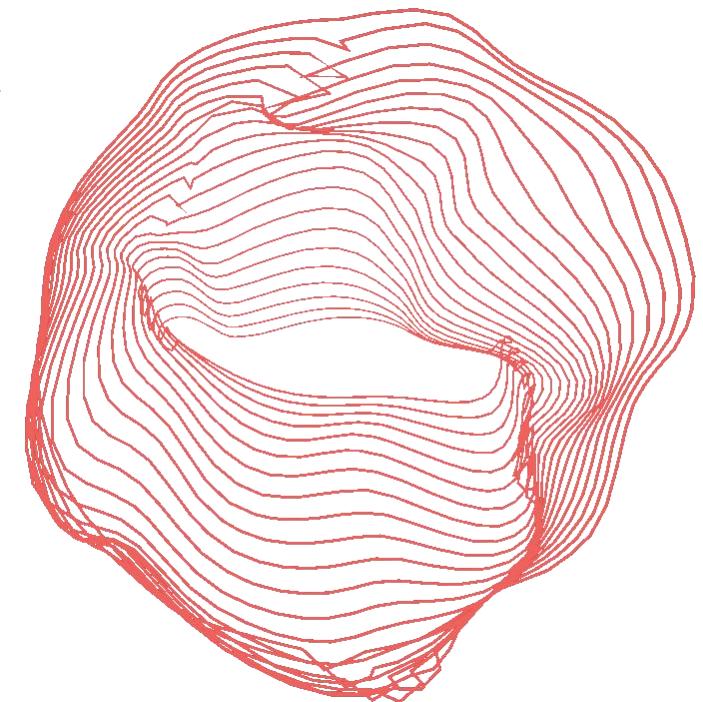
- Cilj trenerjev je **implicitno učenje** gibalnih veščin.
- **IMPLICITNO UČENJE** dosežemo z naslednjimi strategijami:
 - Time pressure
 - Random training (contextual interference)
 - Diferencialno učenje
 - Implicitno učenje + notranje usmerjena pozornost (KR VS KP).
 - Variacija okolja, organizma ter naloge



**All of these put
emphasis on variability.**



**From variability to an End
point!**



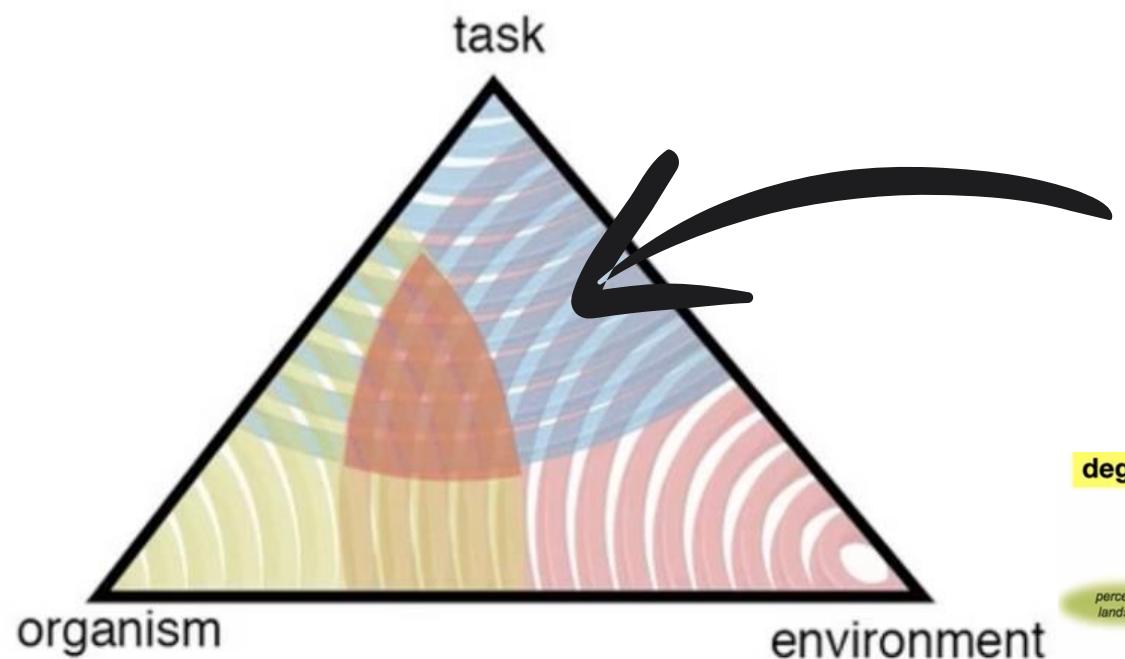
“TOOLBOX” MOTORIČNEGA UČENJA

Shift from Knowledge of performance to Knowledge of result learning - s tem podpiramo pravilno uporabo možganov ter bottom up strategije pri kontroli gibanja.

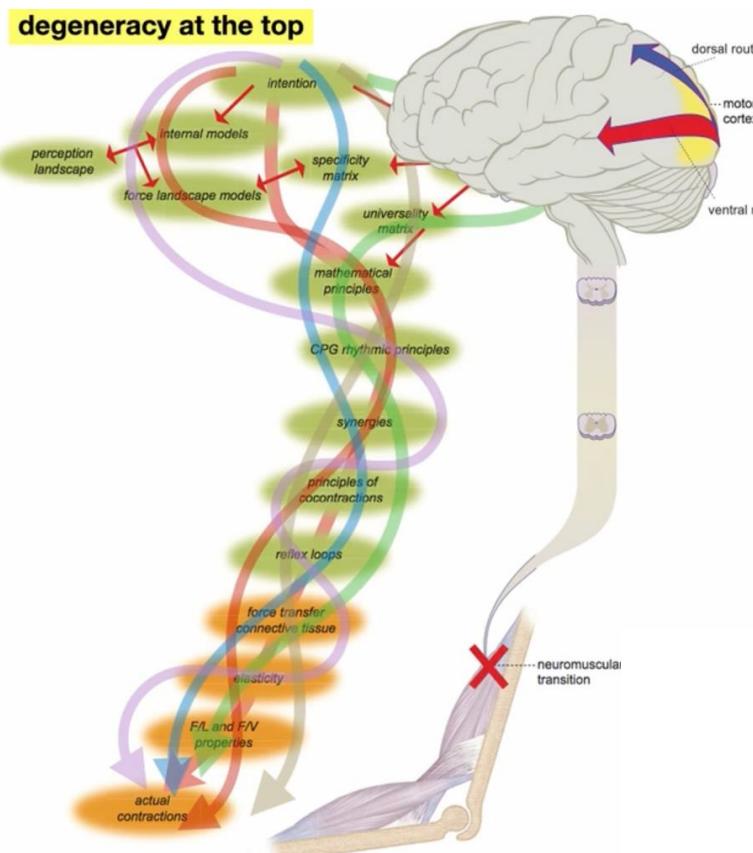
Za učenje potrebujemo “predictive error”, informacije, ki izvirajo iz gibanja morajo biti drugačne kot je bila napoved možganov.

Pomembna je variacija 3 glavnih komponent gibalne organizacije in s tem prekrivanje 3 komponent (organizem, okolje, naloga)

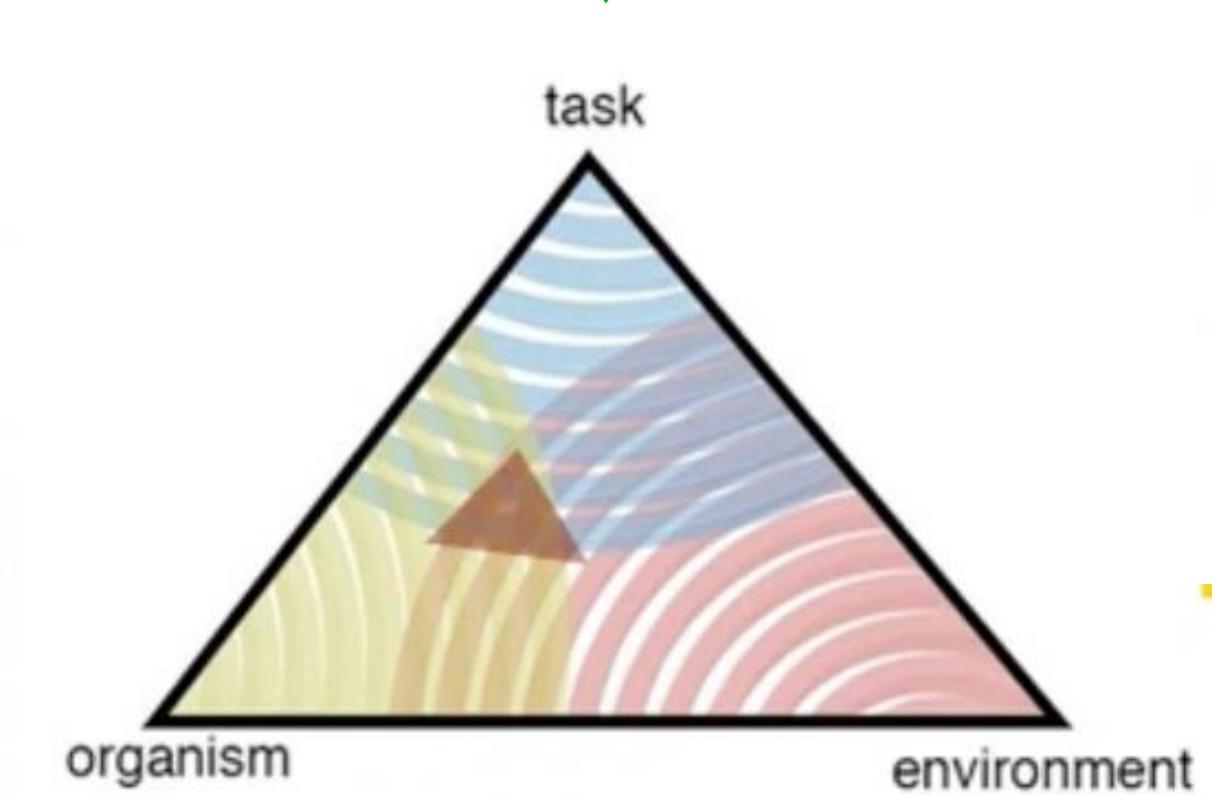
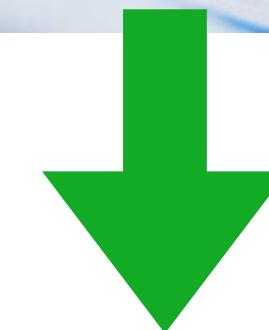
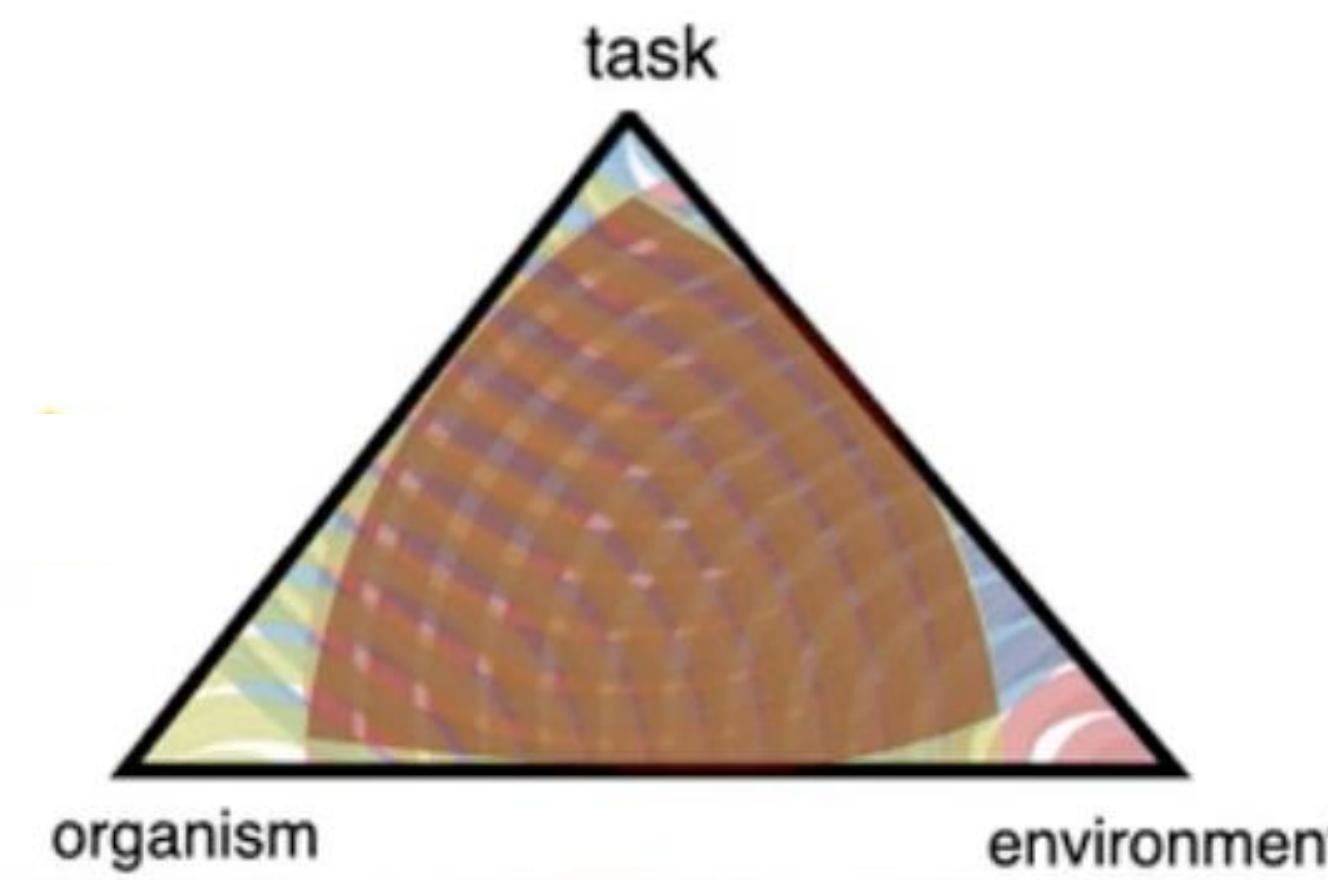
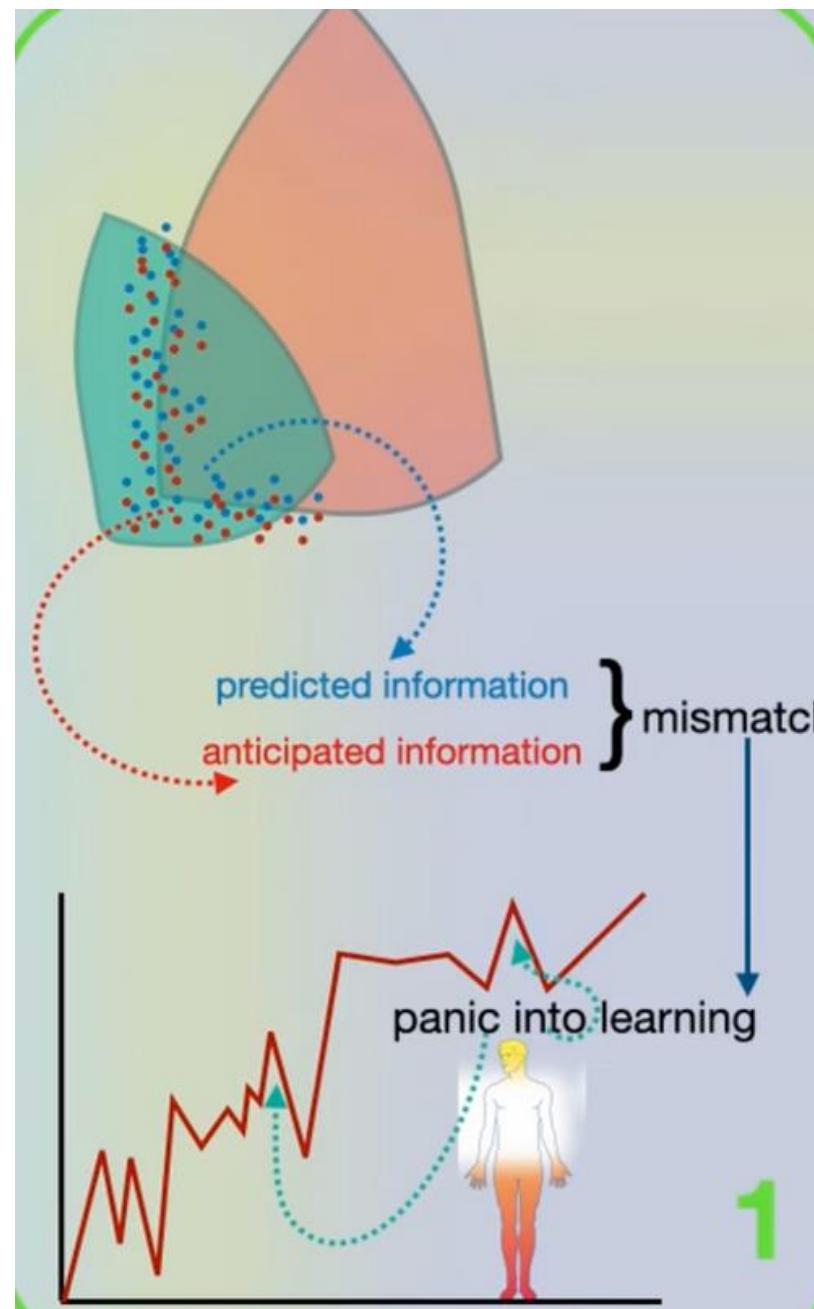
Overlap needs to be small and change all the time!



OVERLAP
!



"TOOLBOX" MOTORIČNEGA UČENJA



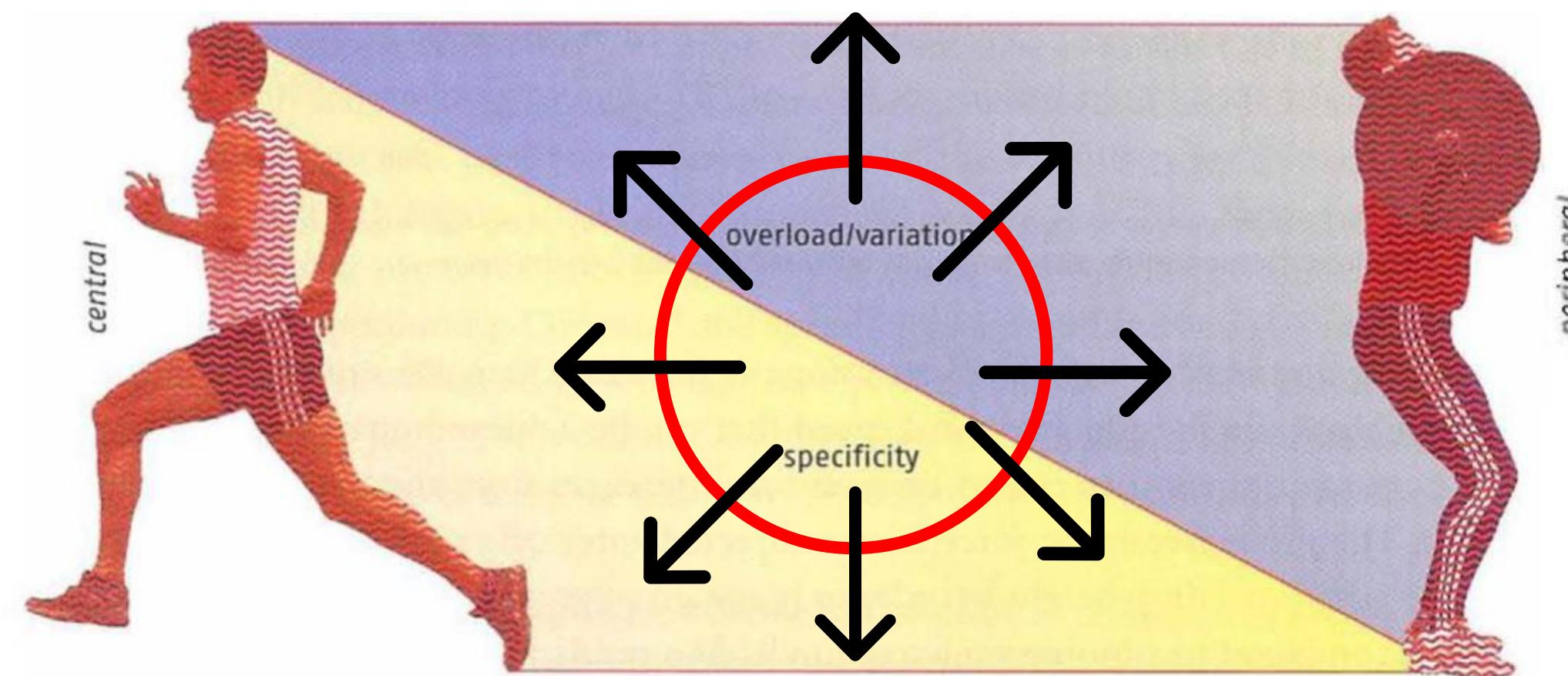
"TOOLBOX" MOTORIČNEGA UČENJA

Use the 3Ps :

- Pretension
- Pressure of time
- Perturbation

EXPLORE THIS
AREA!

No learning at
extremes!

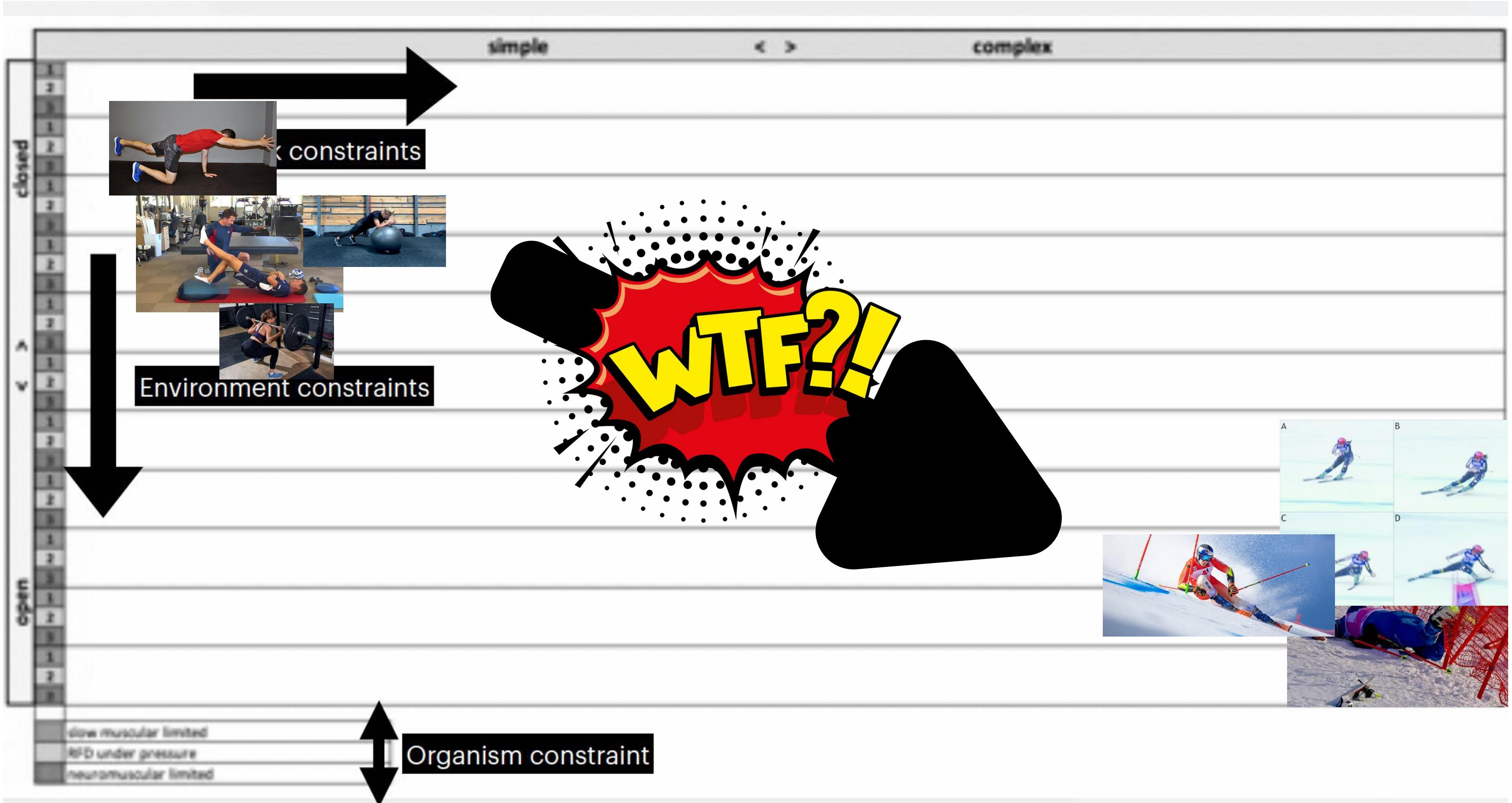


Overload is not just adding weights but increasing variability, use motor learning perspective!



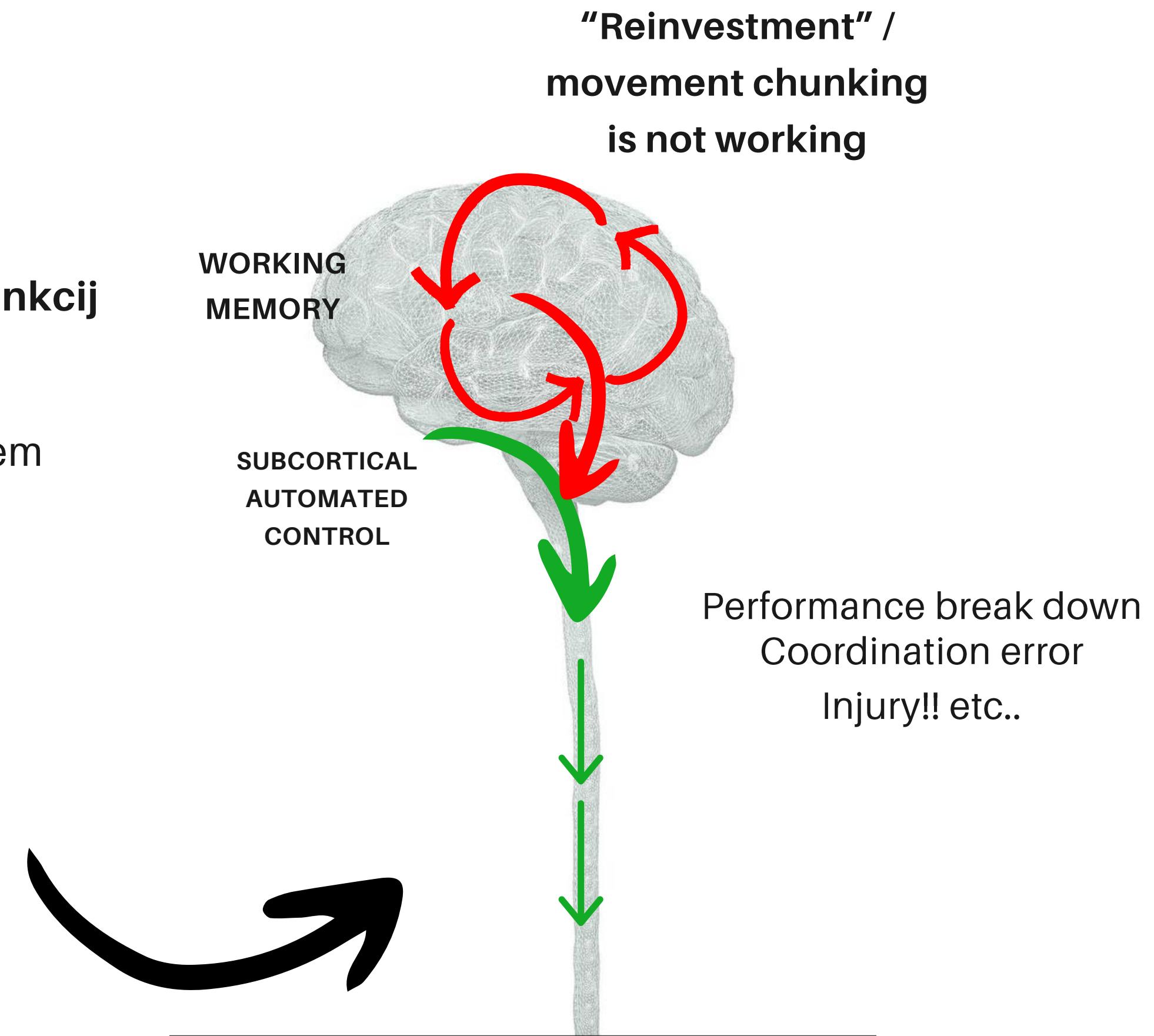
Creating and finding the control mechanisms that is generally valid and fitting into specificity matrix!

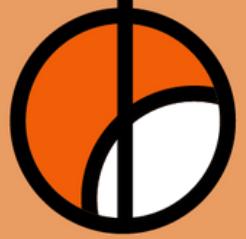
No learning at extremes!



ZAKAJ IMPLEMENTACIJA TEH PRINCIPOV?

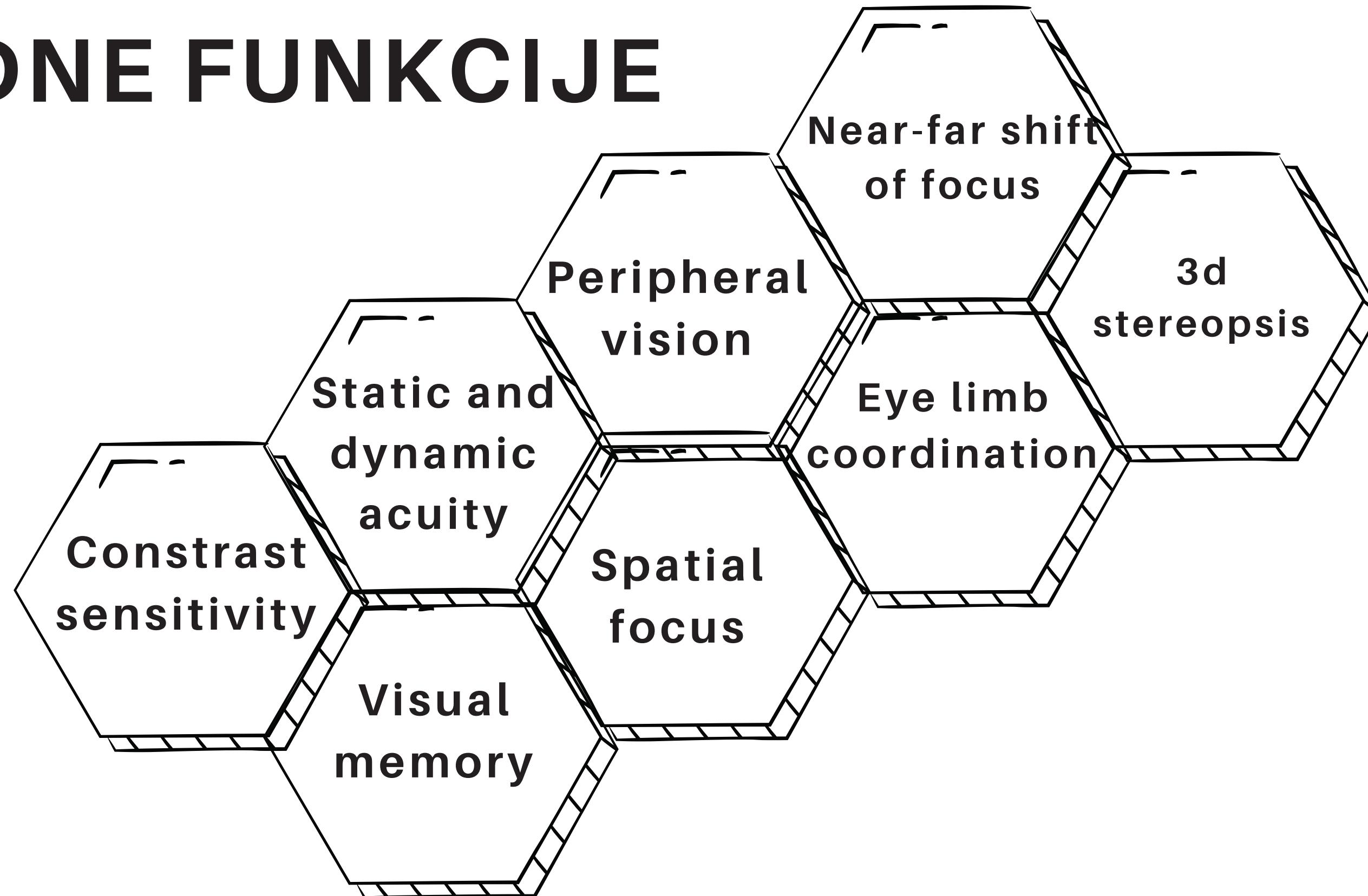
- Razvijanje primerrega **“attractor & fluctuator landscape”**
- Razbremenitev **kognitivno - percepcijskih funkcij**
- Spodbujanje implicitnega učenja (avtomatizem gibanja)
- Preprečevanje poškodb (ACL!!!)
- Preprečevanje “dušenja pod pritiskom” in ponovnega investiranja gibalnih sekvenc.



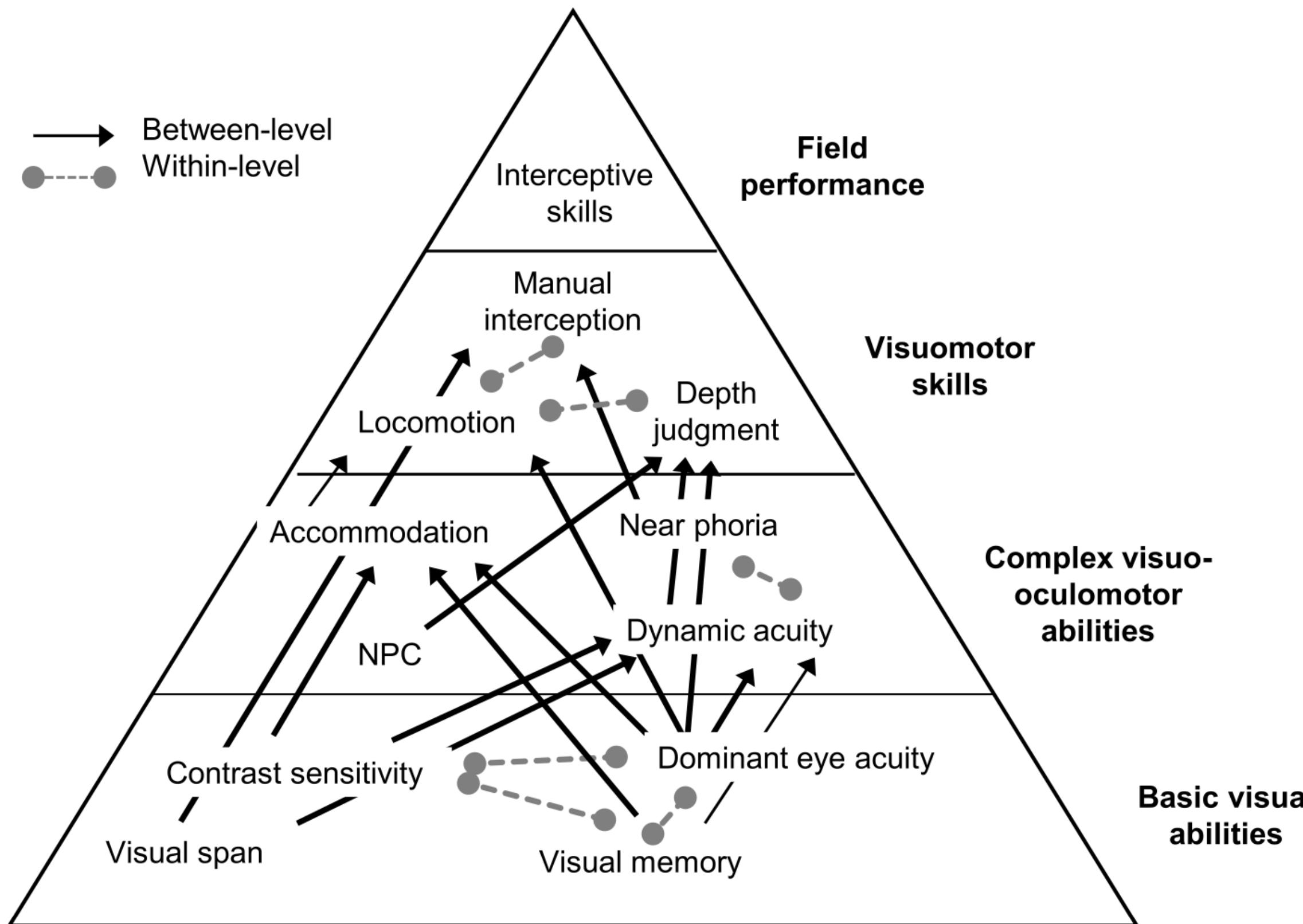


VIDNE, VIDNO-MOTORIČNE TER KOGNITIVNO - PERCEPCIJSKE FUNKCIJE

ŠPORTNO SPECIFIČNE VIDNE FUNKCIJE

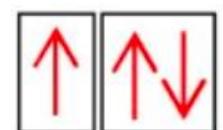
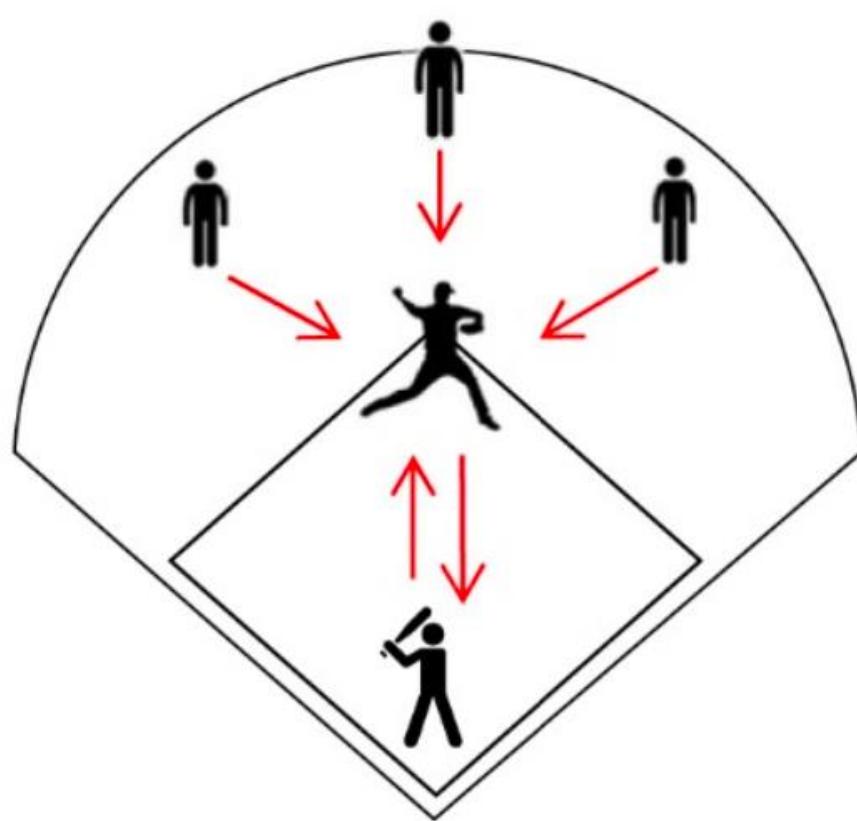


HIERARHIJA VIDNOMOTORIČNIH SPOSOBNOSTI

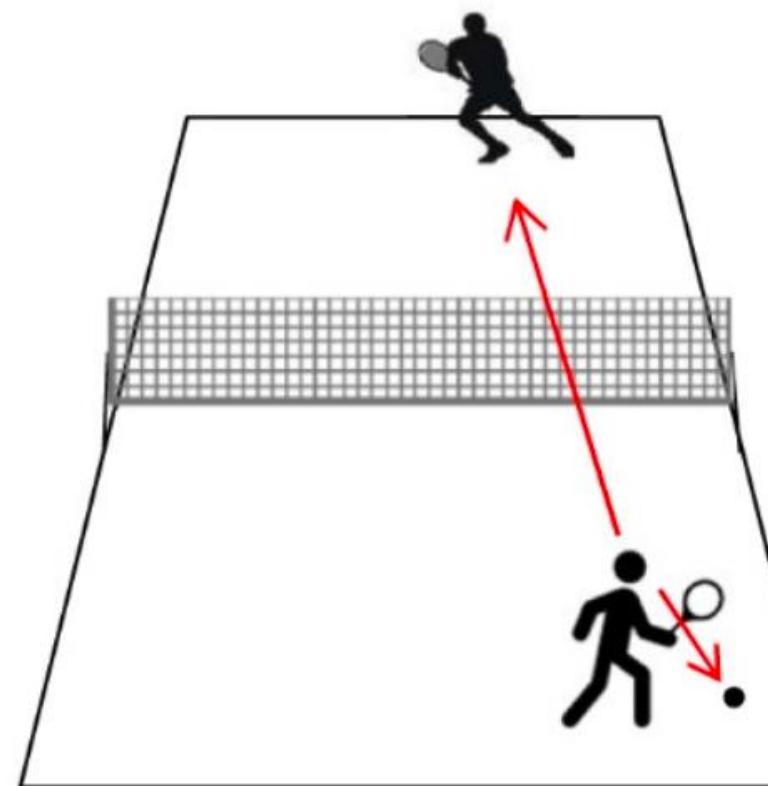


Hülsdünker, T., Strüder, H. K., & Mierau, A. (2018). Visual but not motor processes predict simple visuomotor reaction time of badminton players. European Journal of Sport Science, 18(2), 190-200.

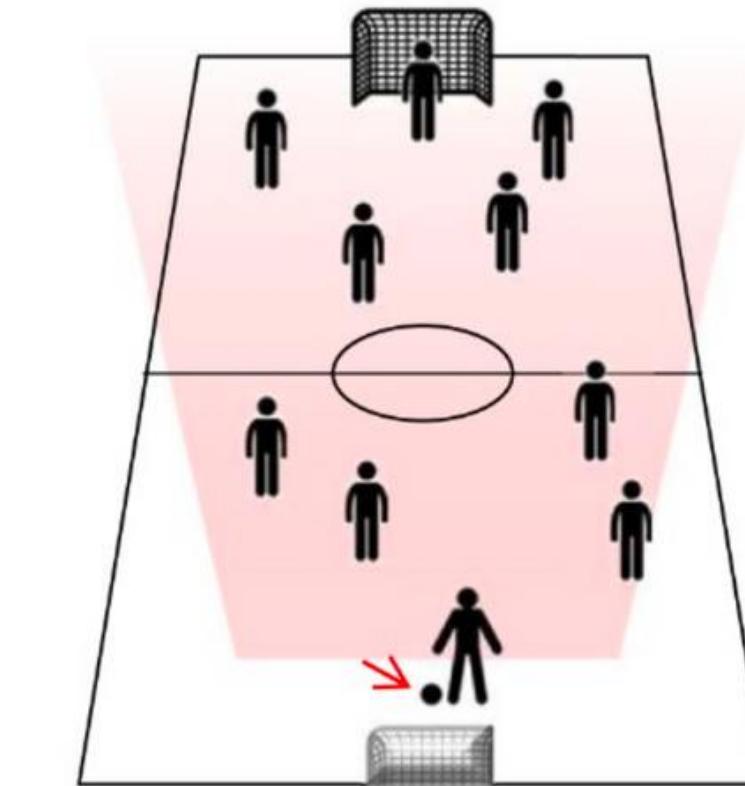
VIDNE VEŠČINE IN VIDNO-MOTORIČNA INTEGRACIJA



Visual focus of players



Visual focus of players



Presta, V., Vitale, C., Ambrosini, L., & Gobbi, G. (2021). Stereopsis in sports: visual skills and visuomotor integration models in professional and non-professional athletes. International Journal of Environmental Research and Public Health, 18(21), 11281.

EYE HAND COORDINATION

DEPTH PERCEPTIONS

NEAR FAR QUICKNESS

SPATIAL FOCUS

SMOOTH EYE PURSUIT/SACCADES

CONTRAST PERCEPTION



VISUAL MEMORY

VISUAL ACUITY

GO/NOGO

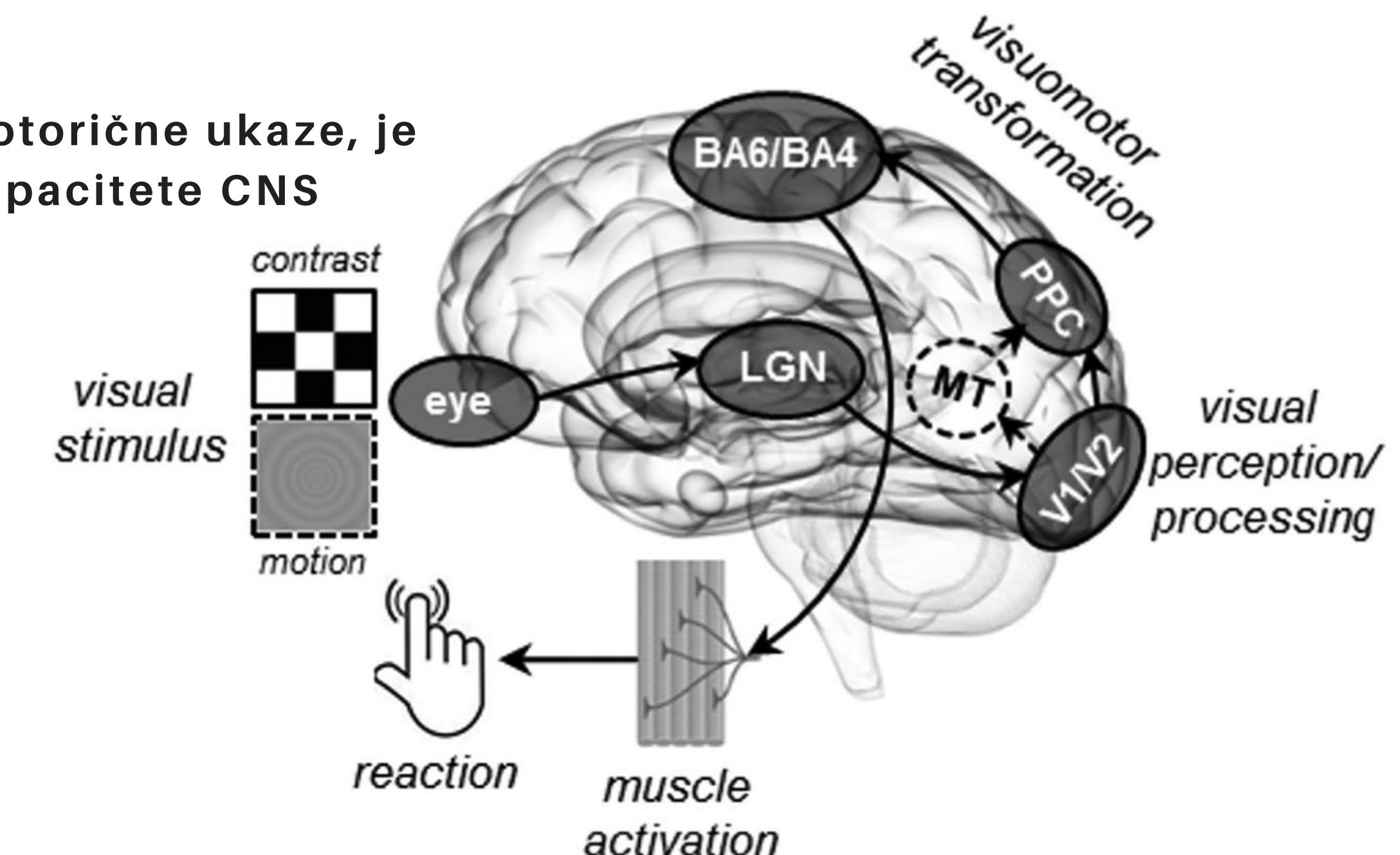
PERIPHERAL VISION

REACTION TIME

VIDNOMOTORIČNA SPOSOBNOST

Hitrejši transfer vidnih signalov v motorične ukaze, je značilnost visoke procesijske kapacitete CNS

Območje nevroplastičnosti pri RT



FUNKCIONALNOST FOVEALNEGA IN PERIFERENGA VIDA V ŠPORTU

Visual Pivot



Foveal Spot



Gaze Anchor



Klostermann, A., Vater, C., Kredel, R., & Hossner, E. J. (2020). Perception and action in sports. On the functionality of foveal and peripheral vision. *Frontiers in sports and active living*, 1, 66.

ŠPORTNE POŠKODBE IN VIDNO PROCESIRANJE



TRAVMATSKE POŠKODBE MOŽGANOV

Kompleksna kaskada disfunkcij kot je nevrotoksičnost, in spremenjen metabolizem nevronov - zatekanje mitohondrijev - nevroni v tem stanju izjemno ranljivi in dodatni pretres lahko povzroči nepopravljivo škodo.

“under reporting”

“25% igralcev hokeja v adolescenci doživi vsaj en pretres možganov na leto”

“večje tvaganje za mišičnoskeletne poškodbe”

“90% igralcev ne prejme pregleda po TBI”

“akumolacija repetitivnih pretresov pri nogometu”

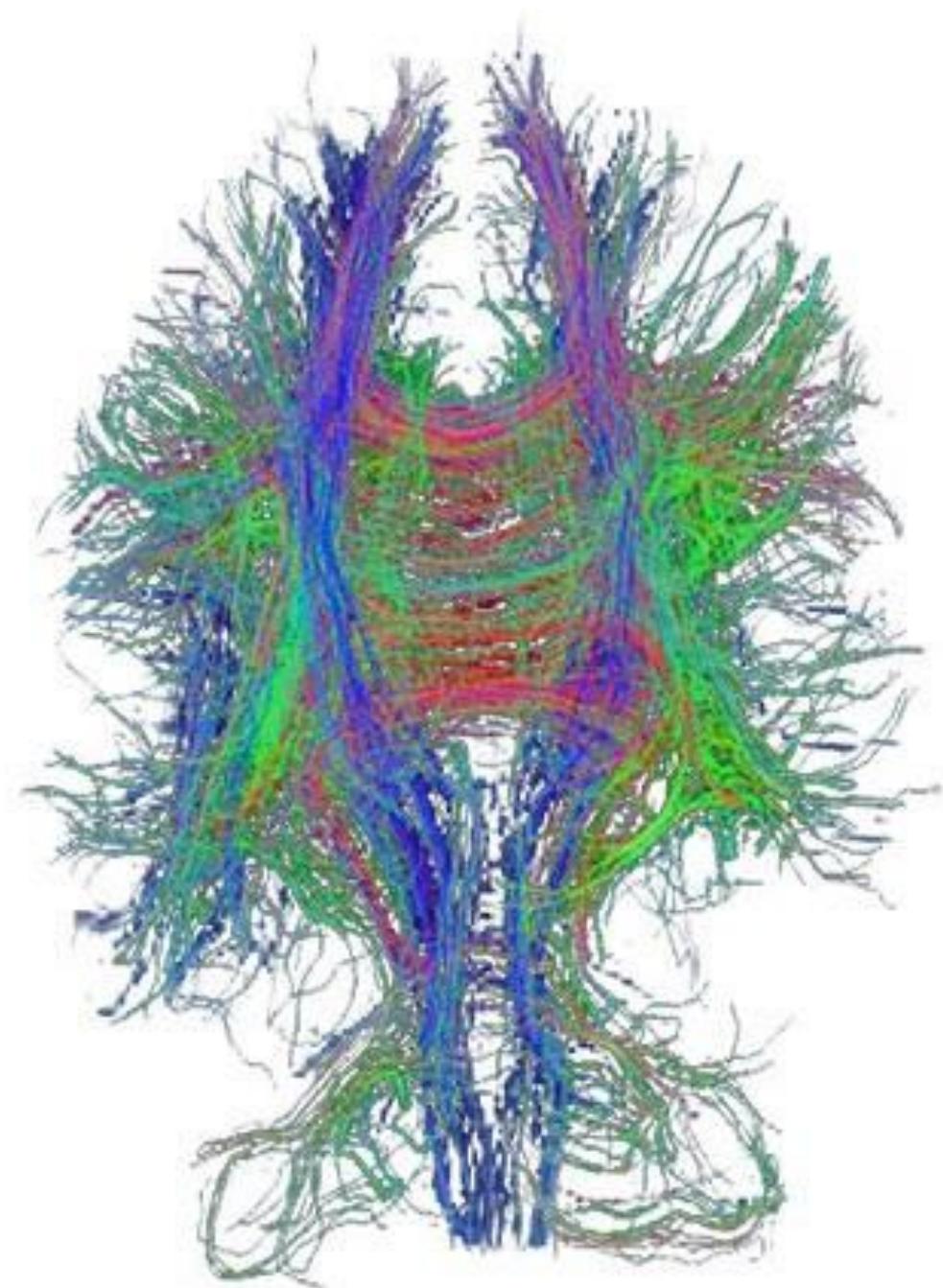
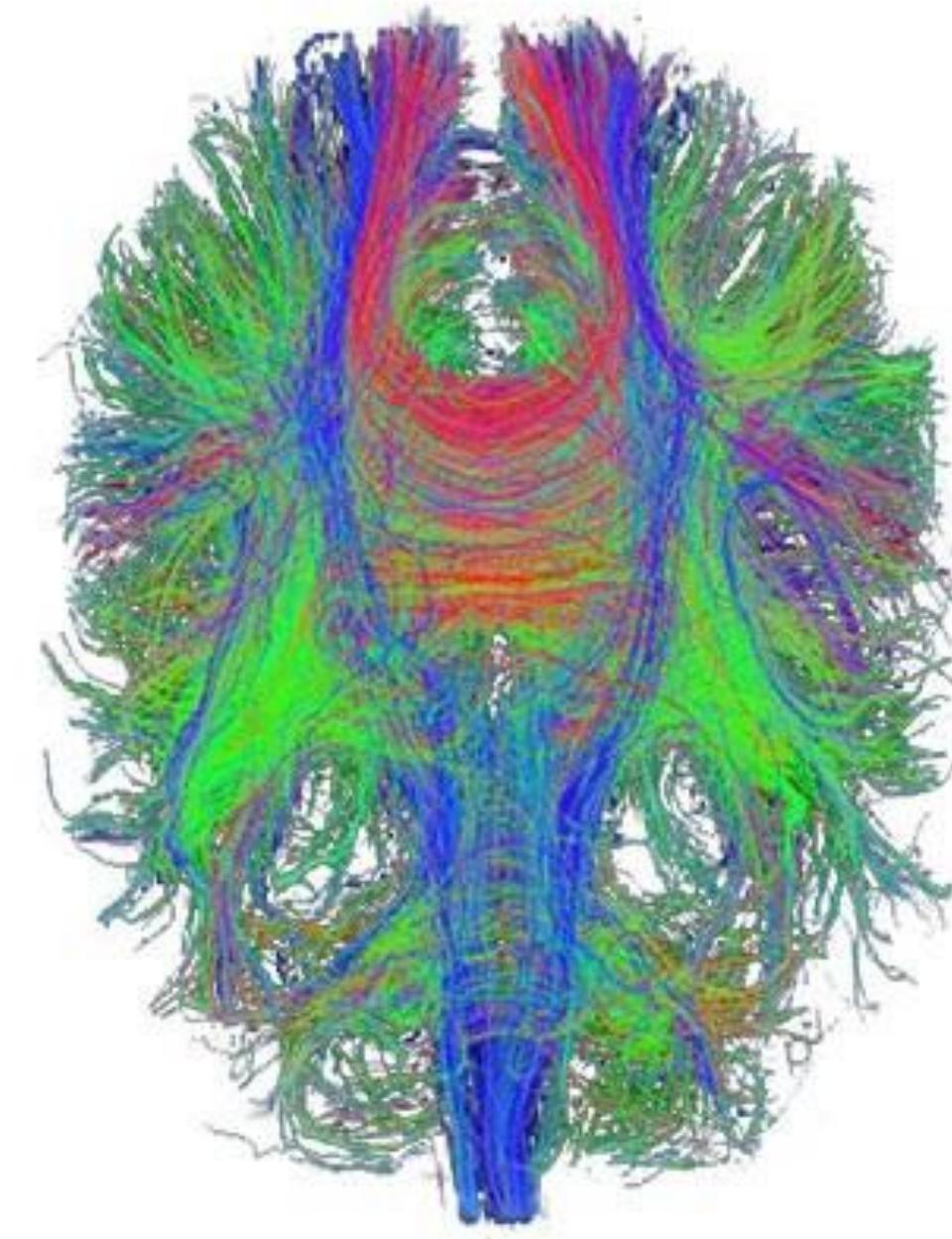
“Predstavljajo 10-13% vseh športnih poškodb pri športnikih srednješolcih”

“več kot 50% možganov namenjenih vidni percepciji, procesirnanju in gibanju oči, difuzna poškodba kot je TBI pogosto prizadane vidna področja”

“do 69% športnikov po poškodbi izkusi motnje vidnih funkcij”

TRAVMATSKE POŠKODBE MOŽGANOV

- Spremenjene okolomotorične funkcije
- Spremenjena akomodacija
- Prizadeta konvergenca
- Smooth eye pursuit
- Prizadete sakade
- Vidno-motorični trening



POŠKODBA ACL KOT NEVROFIZIOLOŠKA DISFUNKCIJA

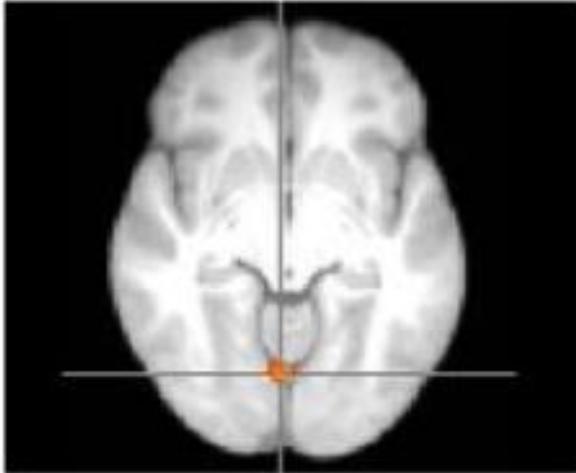
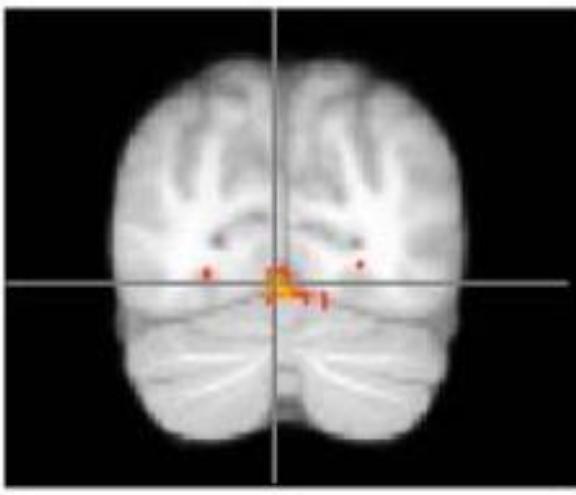
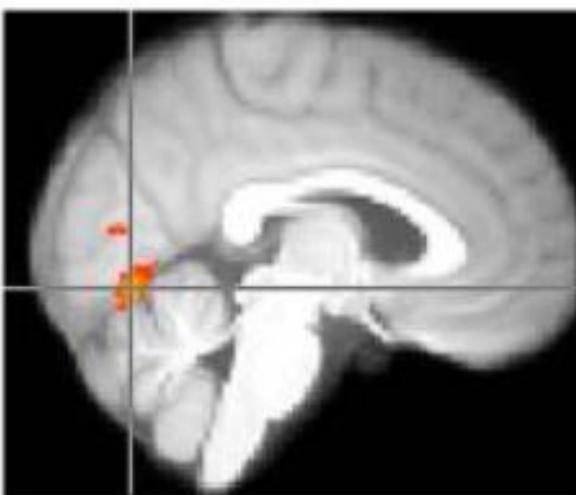
PRED POŠKODOBO

- Zmanjšana vidna fuzija
- Slabše bazične vidne sposobnosti

Slabše kognitivne sposobnosti:

- vidni/verbalni spomin
 - reakcijski čas
- hitrost procesiranja
 - večja kognitivna obremenjenost med dvojnimi nalogami
- slabše inhibitorne kortikalne funkcije (go/nogo)
- **Spremenjene funkcionalne povezave** med specifičnimi senzo-motoričnimi področji (biomarker!)

Lingual Gyrus



PO POŠKODBI

- Spremenjena vzdražnost motoričnih področji
 - Artrogena mišična inhibicija
- Spremenjeno procesiranje senzornih informacij
- Spremenjeno multimodalno vidno procesiranje
 - Še višja kognitivna obremenitev med dinamičnimi nalogami
- Spremenjeno možgansko valovanje (večja kognitivna obremenitev)
 - Odsotni SEP
- Prioritizacija vidnih informacij

LOOK FOR
REINVESTMENT
IMPLICIT LEARNING
CLA APPROACH

POŠKODBA ACL KOT NEVROFIZIOLOŠKA DISFUNKCIJA

Can we reduce ACL injury risk?

- Yes, we can, especially in **female** population
- Multimodal** programs most effective!
- Programs involving plyometrics, landing exercises, strength exercises reduce the risk, balance exercises don't!!
- Motor learning** aspects integrated
- Use CLA and **unplanned exercises..**
- Visual training, visuomotor, cognitive-perceptual training**

Can we reduce ACL reinjury risk?

- Probably with better rehab and adding novel principles of **neuroscience**
- Targeting CNS **neuroplastic changes!**
- Visual evaluation** and training!
- Criteria based rehab!!!!!!**

POŠKODBA ACL KOT NEVROFIZIOLOŠKA DISFUNKCIJA

ZAKAJ IN KAKO PREVENTIVNI PROGRAMI DELUJEJO?



The Influence of Age on the Effectiveness of Neuromuscular Training to Reduce Anterior Cruciate Ligament Injury in Female Athletes:
A Meta-Analysis
Gregory D. Myer, PhD, FACSM, CSCS^{1,2,3,4,5,6}, Dai Sugimoto, MS, ATC, CSCS^{1,6}, Staci Thomas¹, and Timothy E. Hewett, PhD^{1,2,3,4,5,6}
Investigation performed at Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio

Abstract
Background—In female athletes, sports-related injuries to the anterior cruciate ligament (ACL) increase during adolescence and peak in incidence during the mid- to late teens. Although biomechanical investigations indicate that a potential window of opportunity exists for optimal timing for the initiation of integrative neuromuscular training (NMT) in young female athletes, the influence of the timing of initiation of these programs on the efficacy of ACL injury reduction has yet to be evaluated.

Hypothesis/Purpose—The purpose of the current report was to systematically review and synthesize the scientific literature regarding the influence of age of NMT implementation on the effectiveness for reduction of ACL injury incidence. The hypothesis tested was that NMT would show a greater effect in younger populations.

Study Design—Meta-analysis; Level of evidence 1a.

Methods—Data were pooled from 14 clinical trials that met the inclusion criteria of (1) number of ACL injuries reported; (2) NMT program used; (3) female participants were included; (4) investigations used prospective, controlled trials; and (5) age of participants was documented or was obtainable upon contact with the authors. A meta-analysis with odds ratio (OR) was used to compare the ratios of ACL injuries between intervention and control groups among differing age categorizations.

Results—A meta-analysis of the 14 included studies demonstrated significantly greater knee injury reduction in female athletes who were categorized in the preventive NMT group compared

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Address correspondence to Gregory D. Myer, PhD, FACSM, CSCS, Cincinnati Children's Hospital, 3333 Burnet Ave, MLC 10001, Cincinnati, OH 45229 (gmyer@chmc.org).
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Department of Pediatrics, College of Medicine, University of Cincinnati, Cincinnati, Ohio.
Department of Orthopaedic Surgery, College of Medicine, University of Cincinnati, Cincinnati, Ohio.
Joint Health Science Division, School of Allied Medical Professions, The Ohio State University, Columbus, Ohio.
Rehabilitation Science Doctoral Program, College of Health Science, University of Kentucky, Lexington, Kentucky.
Sports Medicine, The Sports Health & Performance Institute, Departments of Physiology & Cell Biology, Orthopaedic Surgery, Family Medicine and Biomedical Engineering, The Ohio State University, Columbus, Ohio.
One or more of the authors has declared that he or she has a conflict of interest related to a commercial entity. The authors received funding support from NFL Charities and the National Institutes of Health (grants R01-AR049735, R01-AR055563, and R01-AR056259).

YUNGER THE BETTER!!

Trenutno ne poznamo natančnega mehanizma delovanja preventivnih ukrepov.

Mogoče delujejo zaradi nevroplastičnih sprememb in ne izboljševanja moči..

Študije kažejo da interacija principov motoričnega učenja ter senzomotoričnega treninga zmanjša tveganje za poškodbo ACL ter ponovno poškodbo ACL

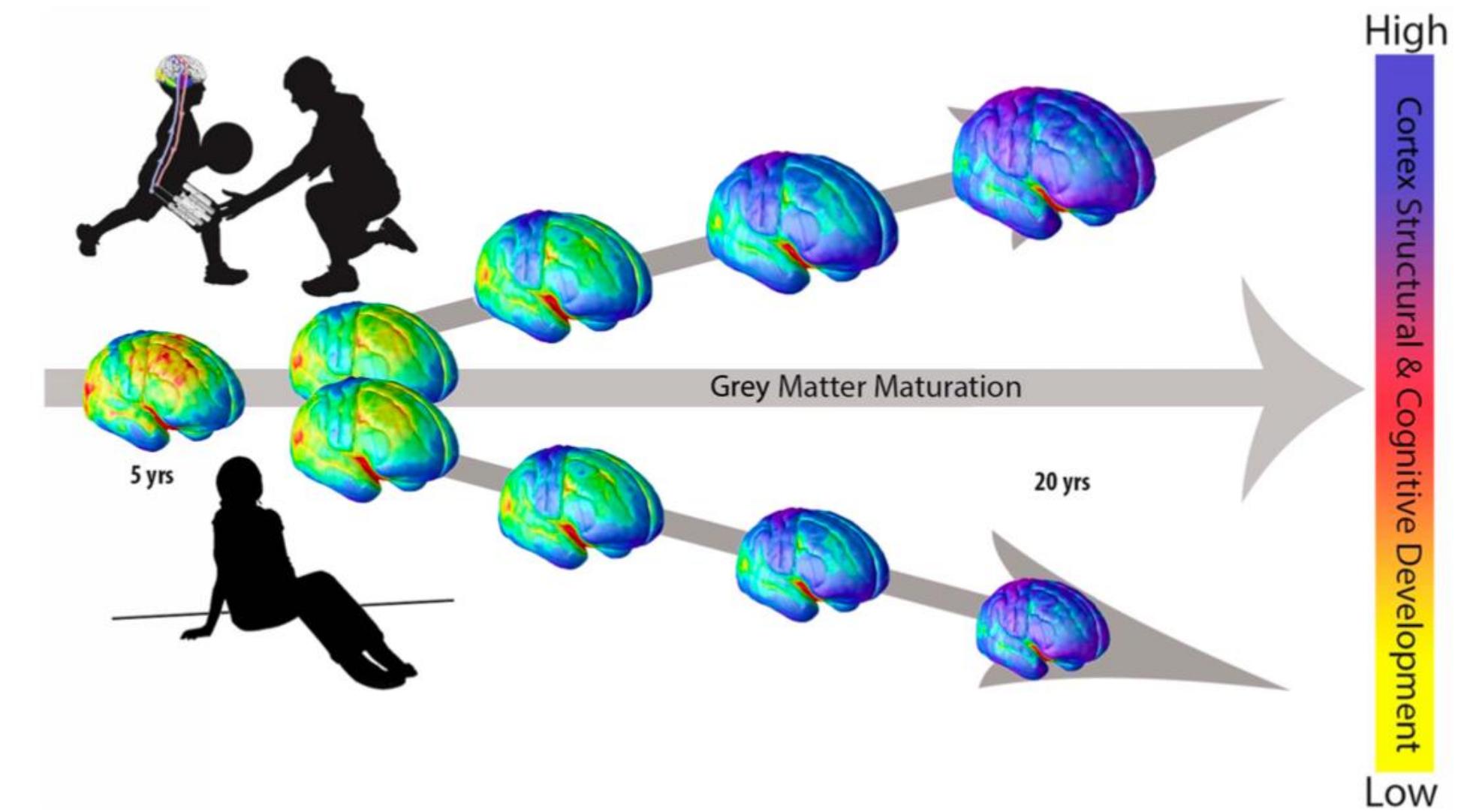
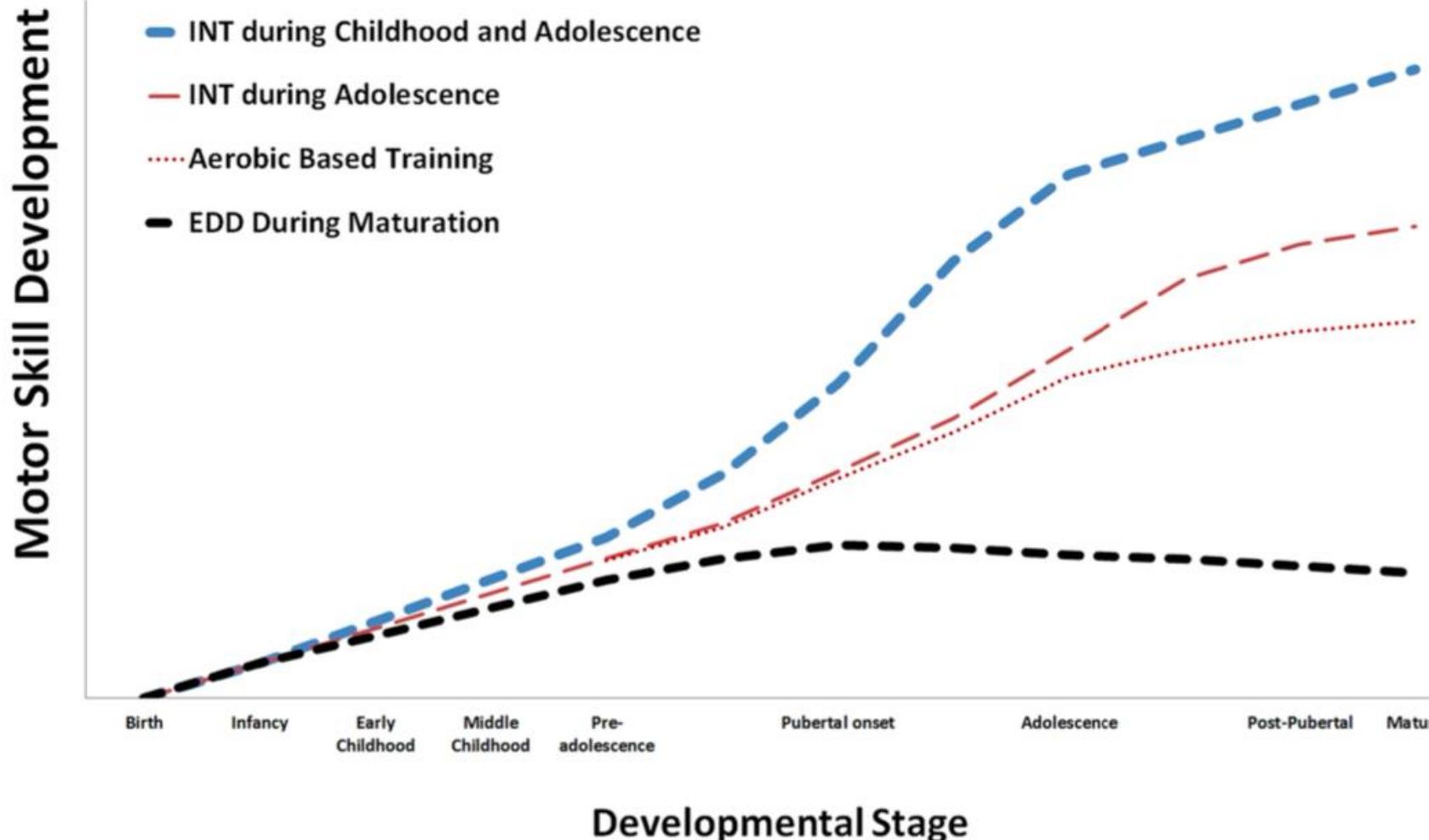
Trening moči in integracija preventivnih ukrepov že v predadolescenci (pred puberteto)

POŠKODBA ACL KOT NEVROFIZIOLOŠKA DISFUNKCIJA

NEURAL DEVELOPMENT IN CONTEXT OF NM, VISUAL AND VISUO - MOTOR AND PERCEPTUAL TRAINING IS **KEY**

START STRENGHT TRAINING EARLY!! For best development of motor capacity.

Single and unique window of opportunity for implementing NM training, cognitive, visual and perceptual aspects of training!!!



VIDNA, VIDNO-MOTORIČNA, KOGNITIVNO - PERCEPCIJSKA OBRAVNAVA

**EVALUATION OF
VISUAL, VISUO-
MOTOR, COGNITIVE
FUNCTIONS**

**TRAINING OF VISUAL,
VISUO-MOTOR AND
PERCEPTUAL-COGNITIVE
FUNCTIONS**



S SENSORY STATION | EVALUATION

4 VISUAL SKILLS

The ability to see, track and keep up with all the moving information.



Visual Clarity

Good vision starts with clear data from the eyes.



Contrast Sensitivity

Detecting contrast is the beginning of vision and is critical for recognizing objects and faces.



Near-Far Quickness

Changing focus quickly is important for movement, spatial judgment, and making timely decisions.



Target Capture

Fast coordination between peripheral and central vision ensure you observe important information.

3 PROCESSING SKILLS

The ability to decide. This function relies heavily on how well we can perceive and process information.



Depth Perception

Judging depth assists in navigation, accurate timing, and proper anticipation for potential collision.



Perception Span

Perceiving and retaining a broad range of visual information helps make quick and accurate decisions.



Multiple Object Tracking

Sensing the movement of multiple objects is crucial for spatial awareness and proper movement.

3 REACTION SKILLS

The ability to implement the decision and perform an action by responding effectively and quickly with speed on demand.



Reaction Time

Reacting quickly to a visual input is crucial to success in all areas of life.



Eye-Hand Coordination

Moving hands quickly and accurately based on visual input is foundational to interaction with the world.



Go / No Go

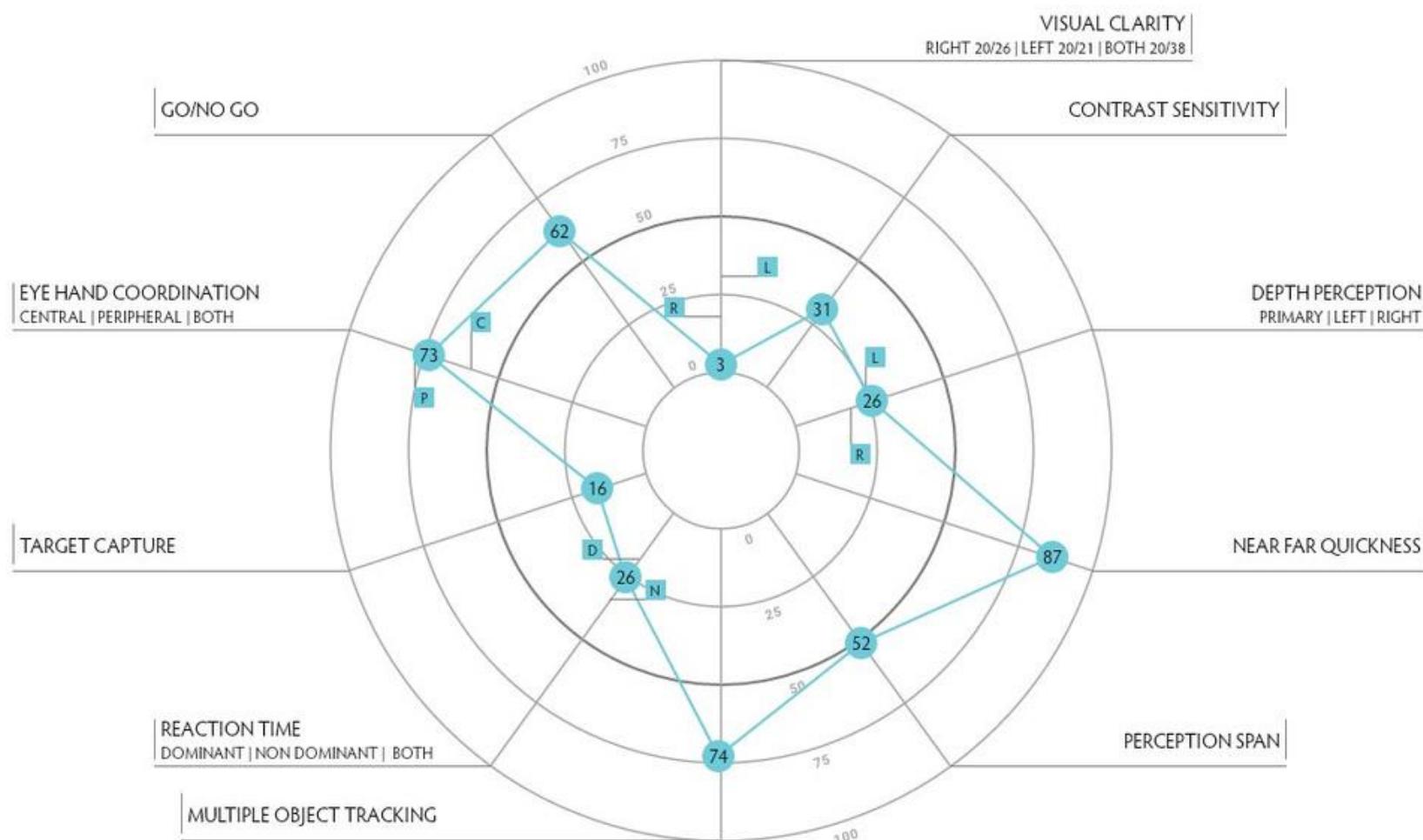
Inhibiting motion in response to new information protects from mistakes and potential injury.

SENSORY PERFORMANCE REPORT

OVERALL SCORE 44



SENAPE

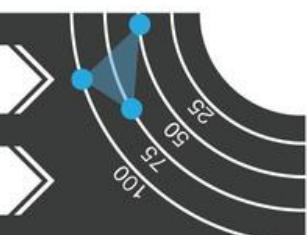


FIRST EVALUATION

06/08/2023 @
14:52

AREA OF INCREASE

PERCENTILE



SPORT

SKIIN

G

POSITION

ALPIN

E

HEIGHT

5'6

"

CURRENT LEVEL

PROFESSIONAL/ELIT

E

COMPARED TO

PROFESSIONAL/ELIT

E SKIING

ALPINE

STRENGTHS

NEAR FAR QUICKNESS

MULTIPLE OBJECT

TRACKING EYE HAND

COORDINATION GO/NO GO

OPPORTUNITIES

VISUAL CLARITY

TARGET CAPTURE

REACTION TIME

DEPTH

PERCEPTION

PREScription PLAN

EYE

EXAM

RECOMMENDED

DYNAMIC VISION

DEPTH PERCEPTION

STROBE EYEWEAR



SENSORY STATION | TRAINING

5 VISUAL SKILLS

Trains your ability to identify and monitor the locations and movements of the ball, teammates and opponents, as everything is moving around all at once.



Dynamic Vision

Trains peripheral vision awareness and rapid eye movement.



Depth Perception

This challenges and trains the ability to make judgments of depth.



Visual Search

Trains the ability to quickly search and find targets, this is critical for navigating most sport and real-world activities.



Shape Cancellation

Trains the ability to attend to what matters most and also identifies if there are visual neglect issues.



Near Far Shift

Trains the eye muscles to rapidly shift focus and recognize details. Quick near far shift capability is important in all sports.

5 PROCESSING SKILLS

Trains executive functions like working memory and pattern recognition to speed up decision making and accuracy.



Perception Training

Trains how quickly one sees information in both central and peripheral vision. This helps the brain's data collection and memory.



Spatial Memory

Trains the cognitive process enabling the ability to remember where an object is in relation to other objects.



Spatial Sequence

Trains the ability to storage and retrieval of information that is needed both to plan a route and to remember where an object is located.



Multiple Object Tracking

Trains the ability to visually track the movements of teammates and opponents simultaneously, critical for all team sports. Also helps avoid collisions.



Split Attention

Combines a central cognitive task with a peripheral motor task to train the ability to divide attention efficiently while performing more than one task at the same time.

4 REACTION SKILLS

Trains your ability to implement the decision and perform an action by responding effectively and quickly with speed on demand.



Eye-Hand Coordination

Trains quickness and accurate response that is essential for anticipating movements, reacting and initiating action.



Go / No-Go

Trains quick decision making and swift movement response.



Response Inhibition

Trains rapid decision-making and muscle response to improve the ability for quickly and effectively adjust ones actions in response to changing game situations, improving reaction time, reducing errors, and enhancing strategic thinking.



Visual-Motor Integration

Trains neuromotor skills that are crucial for coordination activities. This is a complex skill set which encompasses many underlying skills such as visual perception, motor control, and eye-hand coordination.



STROBES

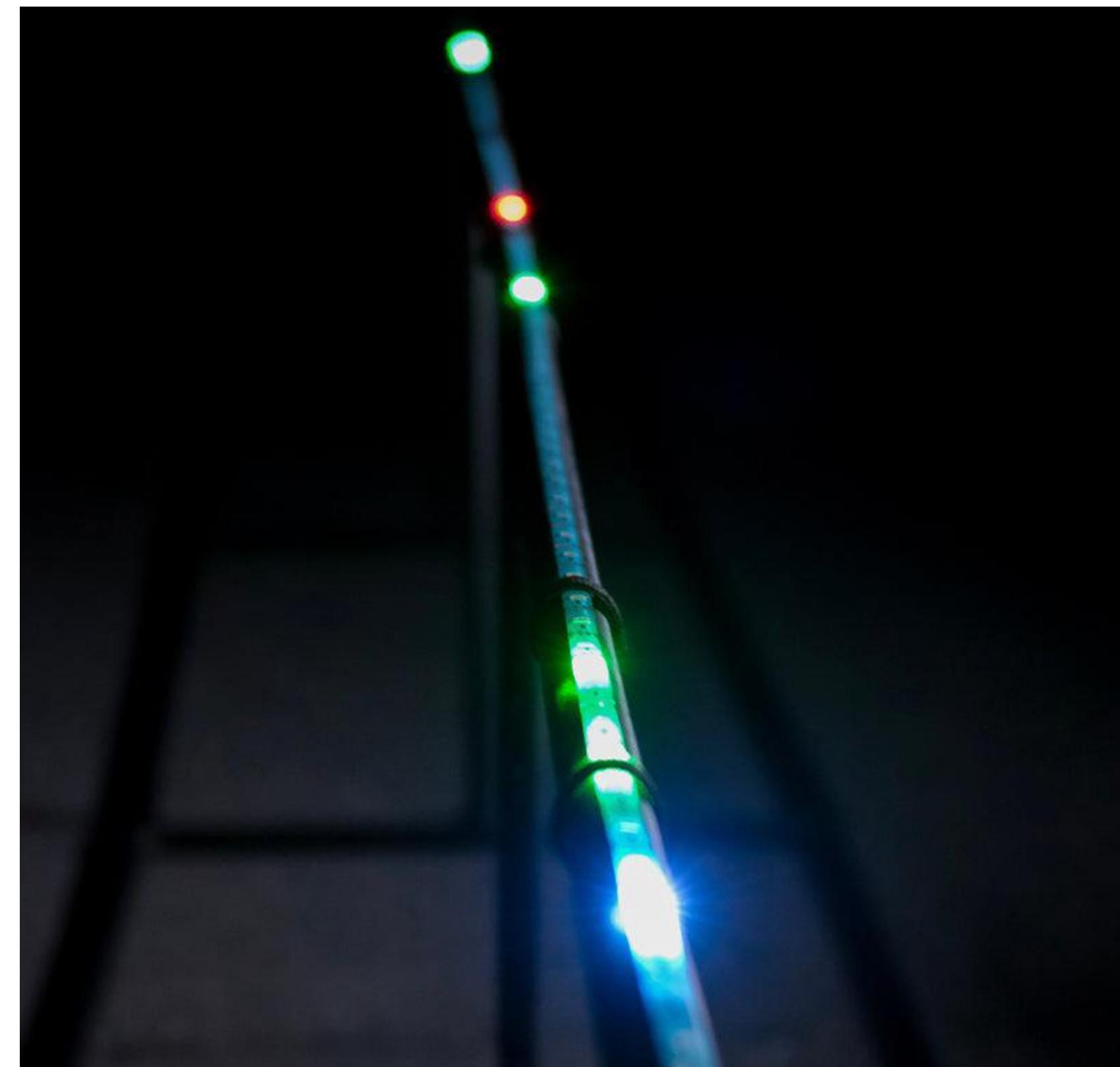
- Anticipation
- Visualization
- Timing
- Depth perception
- Peripheral vision
- Somatosensory reweighting





SYNCHRONY

- Anticipacija
- Sakade
- Timing
- Smooth eye pursuit
- Visuo-motor reaction time





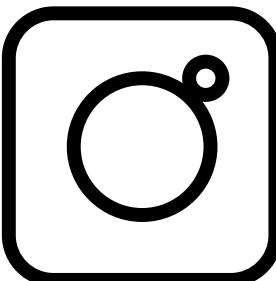
BRAINS & SPRAINS

The screenshot shows the homepage of the BRAINS & SPRAINS website. At the top, there is a navigation bar with the logo, the company name, and links for "Storitve", "O Nas", "Blog", and "Kontakt". Below the navigation is a large image of two people playing a sport outdoors. On the left side of the page, there is a section titled "BRAINS & SPRAINS" with a detailed text about movement and the central nervous system. At the bottom, the website's URL "brains-and-sprains.si" is displayed.

BRAINS & SPRAINS

Gibanje je kompleksen fenomen, pri katerem poleg mišičnoskeletnega sistema sodeluje tudi centralni živčni sistem (CŽS) na katerega vse prepogosto pozabljamo. Ta je izredno pomemben v športnem okolju, ki od posameznika zahteva visoke procesijske kapacitete kognitivnega, živčno-mišičnega ter vidnega sistema. Ti sistemi nam omogočajo učinkovito in varno spopadanje s časovno in prostorsko omejenimi situacijami v športu.

brains-and-sprains.si



@TADEJPASCINSKI