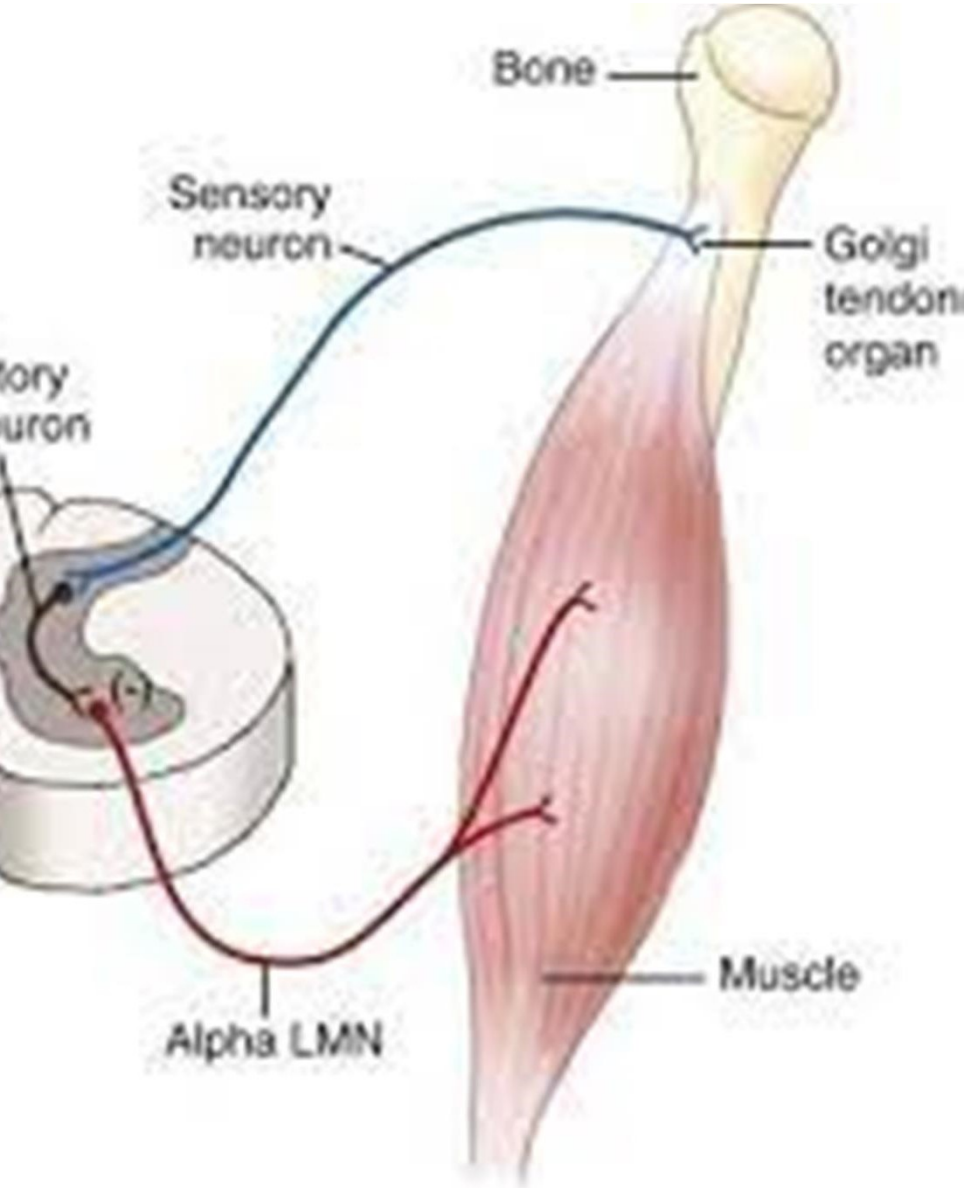
Reflexes



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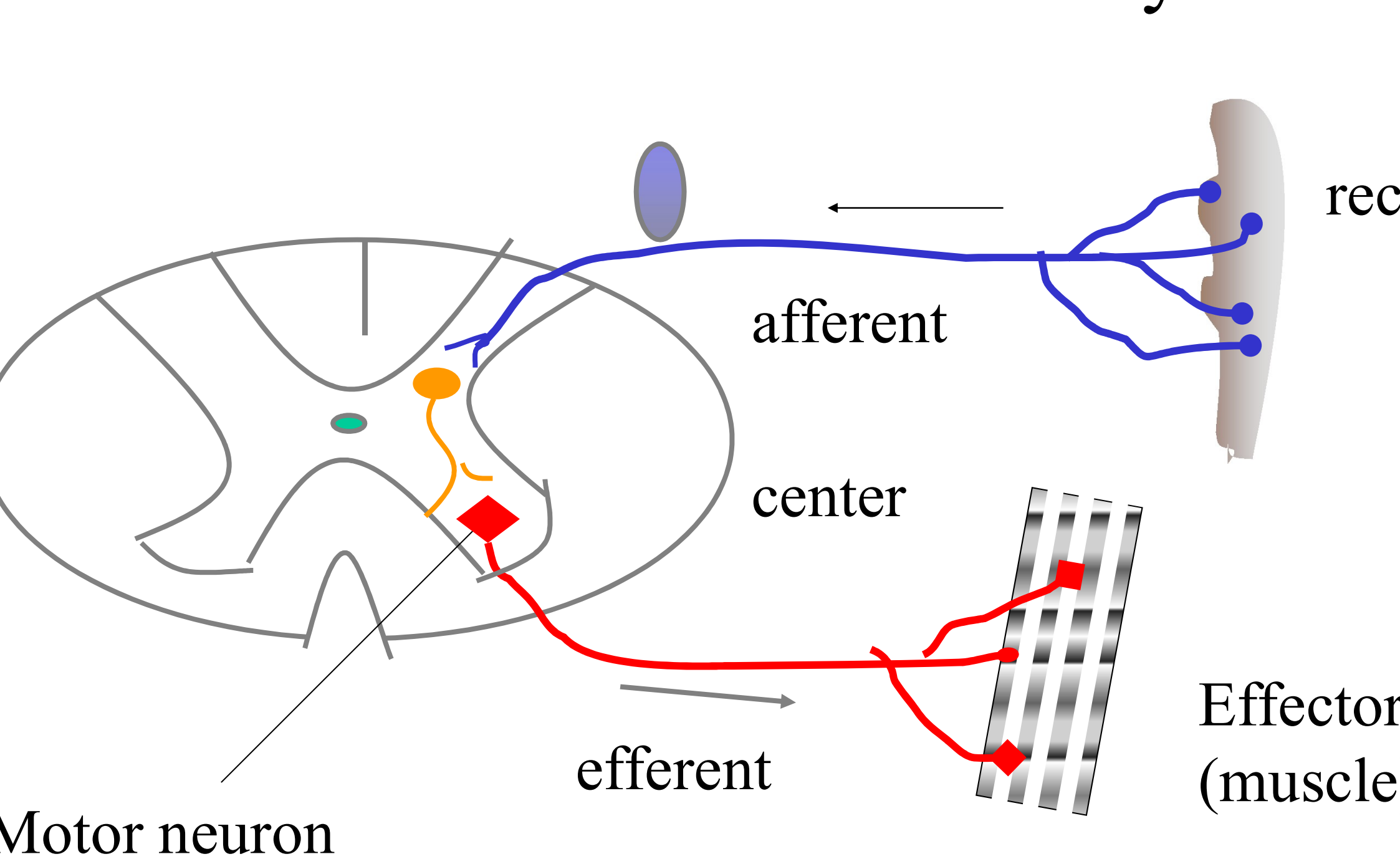
Basic unit of integrated neuronal activit

finition:-

flex is **involuntary response** to a stimulus
ich depends upon **integrity of reflex**
hway.

Or

s a mechanism by which **sensory impulse**
omatically converted into a **motor effect**


rec
afferent
center
efferent
Effector
(muscle
Motor neuron

Receptor

Afferent neuron or nerve

- dorsal root
- dorsal root ganglia or homologous ganglia in the cranial nerves

Efferent limb-

Motor neuron

part of CNS where afferent neuron direct
through interneurons make connections w
motor neuron

Levels of integration –

segments of sp.cord

brain stem

I. based on receptor site

Superficial

skin or mucous membrane

Deep

muscle, tendons

Visceral

Part of reflex arc is formed by autonomic nerves

Patholog

not obs
in nor
pers

a. Segmental

b. Intersegmental

c. Suprasegmental

Physiological –number of synapses

) Monosynaptic

ii) Disynaptic

.According to development

- **Unconditioned**
- **Conditioned**

Properties of reflexes :-

dequate stimulus and stereotyped respons

eflex time and central delay

ecruitment of stimulus

fter discharge

nal common pathway

abituation and Sensitization

response

nitiation of reflex is because of receptor.

A reflex is an involuntary and relatively
tereotyped response to a specific sensory
timulus.

me lapsed bet. application of stim. and
ponse elecited

ue to conduction time and synaptic delay.

entral delay is the time taken for impulse
ss through sp.cord and is related to no. of
napses

g. in knee jerk reflex time is12-19 msec. a

Recruitment of motor neurons :

ting with the smallest motor units,
ressively larger units are recruited with
easing strength of muscle contraction.

itment)

asing the firing rate (firing frequency) at which
dual motor units fire to optimize the summated
n generated (ie, temporal recruitment)

r unit recruitment is a measure of how many motor
ns are activated in a particular muscle, and therefore
sure of how many muscle fibers of that muscle are
ted.

V. After discharge

scharge of impulses from a reflex center after
ation of the receptor has ceased.

lts in **prolongation of the response.**

agnitude of response to stimulus depends
on balance **between excitatory and**
hibitory input of alpha motor neuron

puts of alpha motor neuron –

same spinal segment

interneurons from other segments

descending pathways from brain

lpha motor neuron acts as final common

rington called the **lower motor neurons** of the
l cord the "**final common pathway**".

er motor neurons, therefore, are the final comm
vay for transmitting neural information from a v
urces to the skeletal muscles.

fication of stereotyped responses by exper

uation occurs when we learn not to resp
timulus that is presented repeatedly witl
e, punishment, or reward.

tization occurs when a reaction to a
lus causes an increased reaction to a
d stimulus. It is essentially an exaggera
response.

(STRETCH REFLEX/ DEEP REFLEX/
MYOTATIC REFLEX/ TENDON JERKS)

eflex activity :- when a skeletal musc
intact nerve supply is stretched , it
racts.

retch reflex is a feed back loop that
ntains muscle length and opposes

ulus : stretching of the receptors

eptors : muscle spindles

rents : Ia fibers

rotransmitter : Glutamate

rent : alpha motor neuron

ponse : contraction of the same mu

Monosynaptic

Central delay is 0.6-0.8msec.

More developed in antigravity muscle

Concerned with muscle tone

Helps in maintaining posture

influenced by Jendrassik's maneuver

esponse influenced by various structu
brain

eflex abolished when afferent or effe
rves are cut

ical stretch reflex is associated with
traction of agonist and relaxation of
gonist neuron – known as RI

vantages of reciprocal innervation (R

1. Smooth movement

2. Energy requirement is reduced.

Feedback device to maintain muscle l
Sensitive to rate of change of length a
stretching
- motor activity modifies the sensitiv
of muscle spindles
Maintenance of posture
egulation of muscle contraction

Descending pathways from basal gang
ortical areas, cerebellum and reticular
rmation **modify tone** of the muscle
rough γ discharge

efferent activity is influenced by
nxiety, painful stimulus, unexpected
ovement

Inverse stretch reflex-autogenic inhi

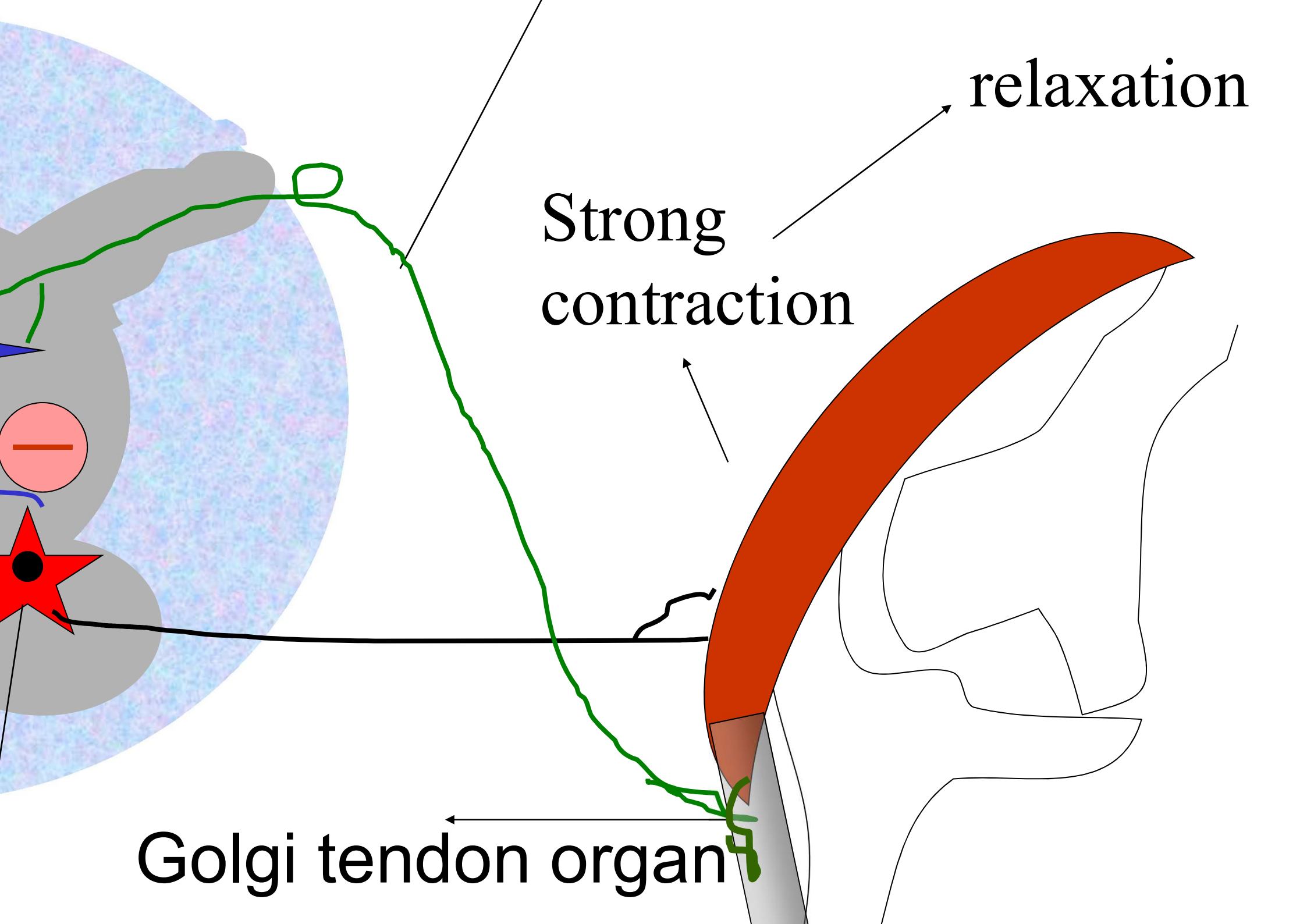
Stimulus – stretching of tendon due to for
contraction of muscle

Receptor – Golgi tendon organ

Afferent – Ib fibers -myelinated

Center – inhibitory neuron in the same se

Efferent – α – motor neurons innervating


relaxation
Strong
contraction
Golgi tendon organ

cle tone is maintained by a **normal reflex ar**

eby a signal is sent from the muscle spindles

r motor neuron in the posterior root ganglion

n then sends a signal to the appropriate musc

just the extent of their contraction.

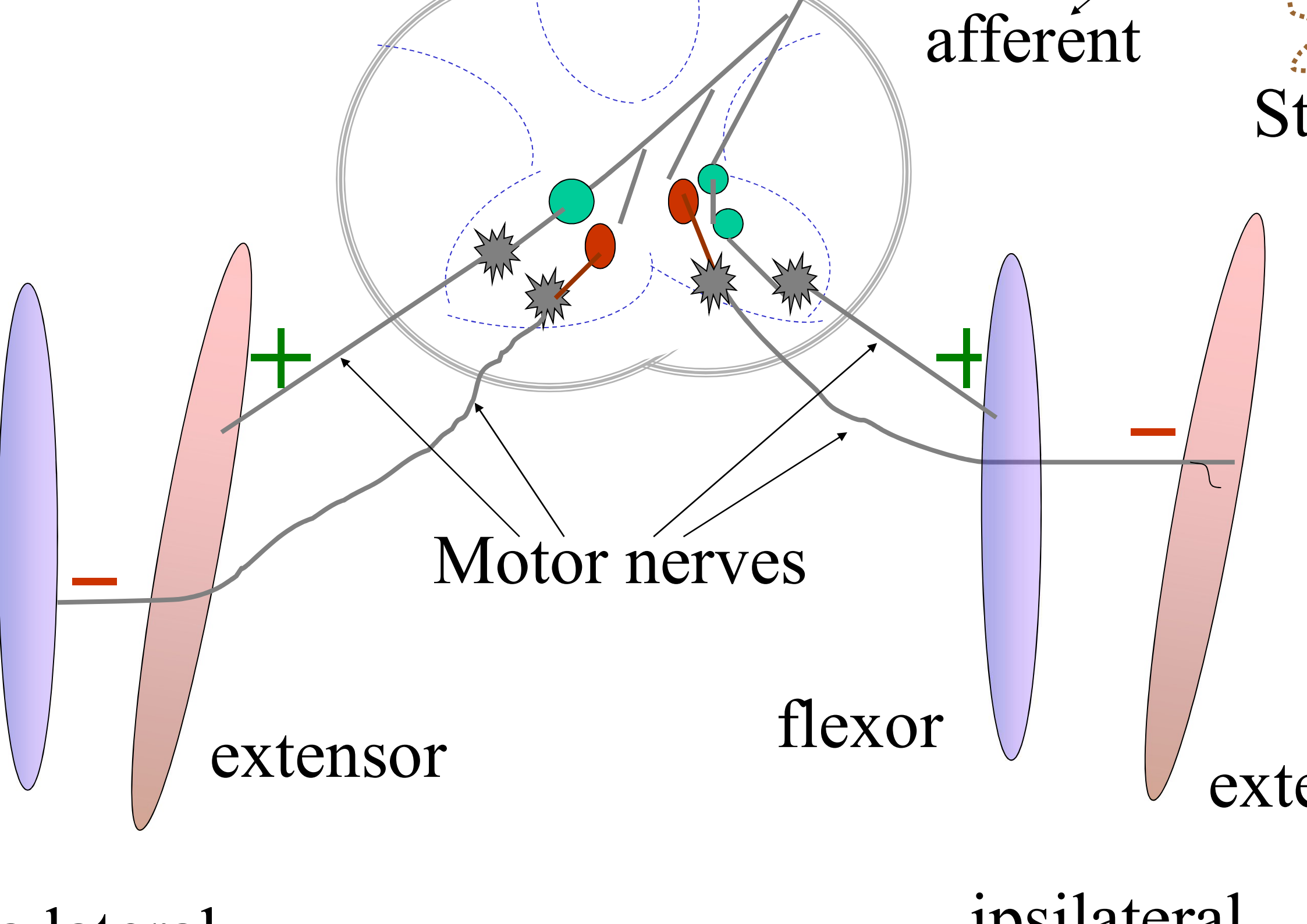
cle tone helps maintain posture and helps mu

the forces of gravity.

Flexor response – by noxious or non-noxious stimul

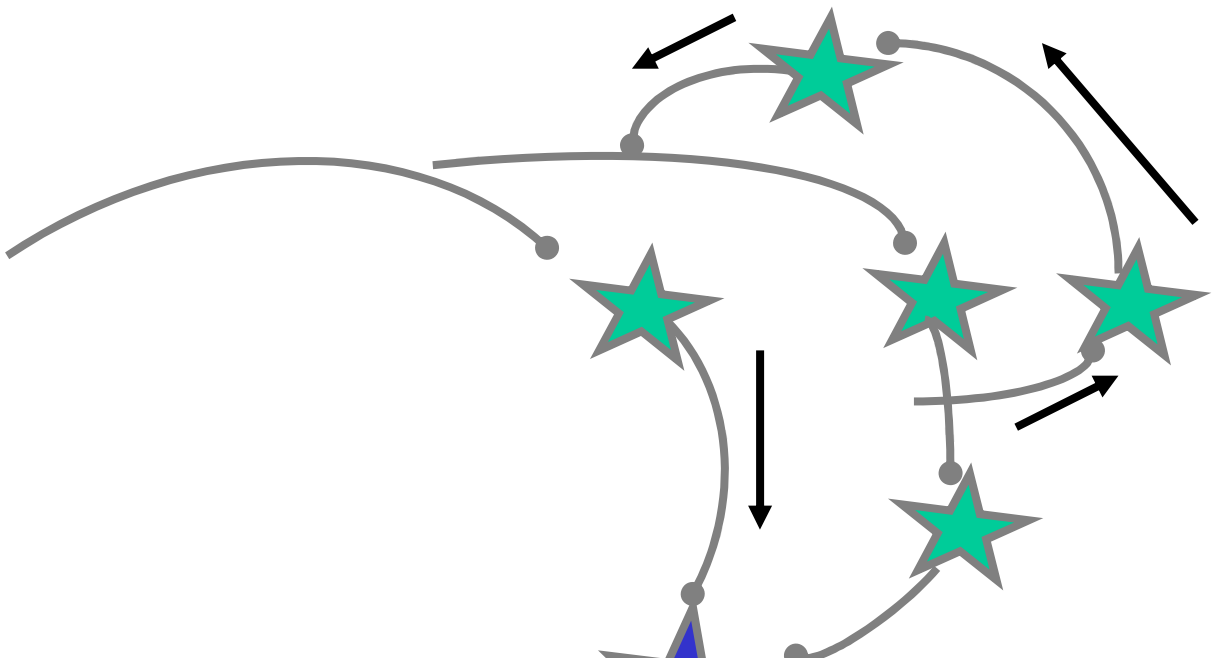
Withdrawal response – by weak noxio stimulation

Crossed extensor response – by strong noxious stimulus


afferent
St
+
+
−
−
Motor nerves
extensor
flexor
exte

omplex branching pattern & variable
synapses in each branch → prolonge
mbardment on motor neuron

everberating circuits – after discharge



ceptors in skin, subcut tissues or mus

diation of impulse to more motor ne

Recruitment of motor units

n stronger stimulus

cal sign – flexor response varies with
t of limb stimulated e.g. stimulation o
dial side →abduction

eaction time decreases with higher
nulus strength –spatial and temporal
nmation

otective function

ulus	Stretching of muscle	General senso nociceptive
ptors	Muscle spindles	Cutaneous
rents	Ia	II, III, IV

se	Monosynaptic	Polysynapt
onse	Contraction of same muscle	Flexion of limb & ext. contralat. L

ation same as stimulus lasts longe

ponse stim.

re of stereotype less stereot

nse

– Both are **basically protective**

- Both are characterized by **recipro**

  innervation

- Both show **integration at α moto**

  neurons which act as final **commo**

  pathway

tch reflexes is called the **lengthening**
ction.

derate stretch ⟹ **contraction**
g., light weight)

ong stretch ⟹ **relaxation**
g., heavy weight)

nically, this can be observed
der hypertonic (spastic) conditions,
hen it is known as the **clasp-knife**
fect.

scle tone so that arms or legs, for example, are stif
difficult to move.

scle tone is regulated by signals that travel from the
n to the nerves and tell the muscle to contract.

scle tone is traditionally defined as '**the tension in th**
xed muscle' or 'the resistance, felt by the examiner
ng passive stretching of a joint when the muscles are

uscle tone is maintained by **a normal**
lex arc, whereby a signal is sent from
muscle spindles to a lower motor
uron in the posterior root ganglion
ich then sends a signal to the
propriate muscles to adjust the extent
their contraction.

uscle tone **helps maintain posture**
d helps muscles resist the forces of
avity.

t causes hypertonia?

injury like lack of oxygen when moving down the bi

tumor.

itions that affect how nerves communicate with musc

to your central nervous system.

ems with how your baby's brain formed during fetal

opment.

e.

e common causes – Hypotonia :

n syndrome.
cular dystrophy.
bral palsy.
er-Willi syndrome.
tonic dystrophy.
fan syndrome.
Sachs disease.