Differences between somatic & autonomic reflex arc

<table>
<thead>
<tr>
<th></th>
<th>Autonomic reflex arc</th>
<th>Somatic reflex arc</th>
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<tbody>
<tr>
<td><strong>1. Receptor</strong></td>
<td>In the viscus or internal organ</td>
<td>In the skin</td>
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<td><strong>2. Afferent</strong></td>
<td>Pass via a dorsal root or cranial nerve &amp; has its cell body in the dorsal root ganglia</td>
<td>The same</td>
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<td><strong>3. Center</strong></td>
<td>Lateral horn cells (LHCs)</td>
<td>Anterior horn cells</td>
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<td><strong>4. Efferent</strong></td>
<td>Composed of 2 neurons: preganglionic &amp; postganglionic in between the 2 autonomic ganglia</td>
<td>Composed of 1 neuron only</td>
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<td><strong>5. Effector Organ</strong></td>
<td>Smooth muscle, cardiac muscle or gland</td>
<td>Skeletal muscle</td>
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<td><strong>6. Velocity of Conduction</strong></td>
<td>Slow due to thin nerve fiber</td>
<td>Fast due to thick nerve fiber</td>
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**Autonomic ganglia act as distribution center:**
- Each preganglionic axon diverges to an average of 8-9 postganglionic neurons → diffuse autonomic output.
- In sympathetic system: preganglionic fiber synapse & activate many postganglionic neurons → generalizing sympathetic effects.
- In parasympathetic system: preganglionic fiber synapse & activate only few postganglionic neurons → localized parasympathetic effects.

**Function of Sympathetic system at rest:**
- The sympathetic system is continuously active.
- The basal rate of activity is called "sympathetic tone".
- The sympathetic tone is mainly to maintain arterial pressure & help in distribution of blood to the various tissues.
Function of Sympathetic system in emergency
(Alarm response 'stress response'):
1. **Eye:** dilatation of the pupil more light into the eye.
2. **Heart:** increase heart rate & force of contraction & increase blood pressure
   \[\rightarrow\] better perfusion of the vital organs & muscle.
3. **Lung:** bronchodilatation to ensure better ventilation & more \(O_2\).
4. **Liver:** increase glycogenolysis elevating blood glucose level
5. **Spleen:** Contraction of Splenic capsule & squeezing of blood rich RBCs into the circulation.
6. **Adrenal medulla:** secretion of adrenaline & noradrenaline in the blood
   potentiating sympathetic activity.
7. **Skin:** - Vasoconstriction of blood flow limiting bleeding if wound.
   - Sweat glands: secretion of sweat increasing heat loss from the body.
8. **Muscle:** Orbelli phenomenon: Better contraction, delayed fatigue & early recovery
   of skeletal muscle after fatigue.
9. **Blood vessel:** the blood flow is shifted from peripheral & unimportant organs
   as skin & splanchnic areas to important areas as CNS & muscle.
10. **Metabolism:** increase glucose & free fatty acids level supplying more energy.
11. **CNS:** - increase mental activity.
    - Activation or reticular formation: reinforcing the alert & arousal state.

- **Types of cholinesterase:**
  * **True cholinesterase:**
    - Present in the cell membranes of cholinergic nerve terminals.
  * **Pseudocholinesterase:**
    - Present in the fluid surrounding the cholinergic nerve terminals as small amount
      of \(ACh\) diffuse to the surrounding fluids.
- **Value of cholinesterase:**
  - It's value is to keep action of \(ACh\) localized in the site of liberation, otherwise
    it may diffuse to the blood giving generalized effect.

6. **Role of adrenal medulla in function of sympathetic system:**
   - The organs are actually stimulated by 2 ways at the same time:
     * **Directly** by sympathetic nerves.
     * **Indirectly** by medullary hormones adrenaline & noradrenaline.
   - Total loss of 2 adrenal medulla has a little effect on the sympathetic actions
     because the direct pathway can still perform all necessary functions.