Spinal circuit

The spinal locomotor circuit is charged with the task of driving groups of motor neurons rhythmically in such a way that their concerted activity leads to appropriate motor output

---

The significance of the spinal circuitry in controlling postural and locomotor functions largely re-emerged in the mid-1970s under the leadership of Sten Grillner, demonstrating key phenomena of "central pattern generator" and "fictive locomotion" with an evolutionary perspective. These concepts raised the question of how much function can be recovered after paralysis, given the intrinsic automaticity of spinal networks in injured and uninjured states in adults.

Areas covered: This review explores biological mechanisms governing spinal control of movements such as posture and locomotion. We focus on concepts that have evolved from experiments performed over the past decade. Rather than a comprehensive review of the vast literature on the neural control of posture and locomotion, we focus on the various mechanisms underlying functional automaticity, and their clinical relevance.

Expert opinion: We propose that multiple combinations of sensory mechanoreceptors linked to proprioception generate an infinite number of different sensory ensembles, having species-specific meaning and extensive influence in controlling posture and locomotion. These sensory ensembles are translated as a probabilistic phenomenon into highly specific but indeterminate actions. Therefore, we opine that spinal translation of these ensembles in real-time plays a central role in the automaticity of motor control in individuals with and without severe neuromotor dysfunction [1)].

1)
Edgerton VR, Gad P. Spinal automaticity of movement control and its role in recovering function after spinal injury. Expert Rev Neurother. 2022 Aug 31. doi: 10.1080/14737175.2022.2115359. Epub ahead of print. PMID: 36043398.