Table 1. Description of the robotic device(s) used as a tool for rehabilitation of individuals with SCI.

<table>
<thead>
<tr>
<th>Robotic device (s)</th>
<th>Features</th>
<th>Additional information available in the reviewed articles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Treadmill</td>
<td>BWS</td>
</tr>
</tbody>
</table>
| ARGO (A) [9, 20].   | O         | O   | ●  | ●    | —                        | ●                                        | ● Excessive energy expenditure due to the use of devices to assist gait such as crutches to help walk.  
● Gait pattern is not physiologic.  
● Allows hip flexion of a lower limb to the lower contralateral member through a reciprocal bond. |
| Brain-controlled robotic exoskeleton (EXO) (B) [11]. | O         | O   | ●  | 12   | —                        | O                                        | ● Can be associated with BWS, sensory feedback, and pressure sensors, wire sensors, gyroscopes and EEG.  
● Designed to be anatomically coherent with the body of an individual, because hip-to-knee segments of the legs could be adjusted to accommodate a variety of different leg lengths. |
| EKSO (C) [22, 23, 26, 27]. | O         | O   | ●  | 4    | —                        | ●                                        | ● Passive spring-loaded ankle joints.  
● Backpack that houses a computer.  
● Battery supply.  
● Wired controller.  
● Provides support from the posterior pelvis to the upper back.  
● A step will not be triggered unless crutches are firmly on the ground.  
● Do not present severe orthostatic hypotension, significant cardiac or vascular disease and integumentary issues such as open wounds.  
● No pregnancy.  
● Do not present significantly decline of bone density as indicated by DXA or a history of pathological fractures.  
● Patients which do not present bilateral upper-extremity strength, one functional upper extremity or one functional lower extremity.  
● Patients with contractures greater than 10 in the hip or knee joint, leg length differences more than 2 cm or total hip replacements. |
<table>
<thead>
<tr>
<th>Device</th>
<th>O</th>
<th>O</th>
<th>•</th>
<th>—</th>
<th>—</th>
<th>•</th>
<th>Details</th>
</tr>
</thead>
</table>
| HAL (D) [12, 25, 26]         | O    | O    | •    | —    | —    | •    | ✤ Excessive energy expenditure due to a need for gait assistance devices such as crutches to help walk.  
      ✤ Present a frame and robotic actuators that attach to the patient's legs.  
      ✤ Joint movement is supported by electric motors.  
      ✤ Initiate by minimal bioelectrical signals detected via surface EMG electrodes measured in hip and knee extensor and flexor muscles.  
      ✤ Can be associated to treadmill and BWS.  
      ✤ Enables to help sitting, walking, and standing as well as sit-to-stand, stand-to-walk, walk-to-stand, and stand-to-sit transitions or sit with 100% powered robotic assistance.  
      ✤ Developed based on the user's ability to affect its center of pressure via the use of the upper body in combination with a stability aid.  
      ✤ Excessive energy expenditure due to a need for gait assistance devices such as crutches to help walk.  
      ✤ Height range 155 – 191 cm.  
      ✤ Maximum hip width 42.2 cm.  
      ✤ Femur length range 35 – 47 cm.  
      ✤ Spasticity score: Modified Ashworth score 3 or lower.  
      ✤ It is necessary sufficient upper body strength to balance and supports the forearms crutches, front-wheeled walker or platform walker.  
      ✤ For complete and incomplete spinal cord injured individuals T4 or below.  
      ✤ A Bluetooth LE radio allows communication between the Indego and iPhone or iPod touch through the custom Indego iOS application.  
      ✤ Patients can activate their core muscles and experience balance aspects.  
      ✤ Video monitor up front.  
      ✤ Allows lateral translation and transverse rotation of the pelvis.  
      ✤ Gait pattern is physiologic.  
      ✤ Compatible with pediatric orthoses.  
      ✤ Video monitor up front.  
      ✤ Used to measure isometric force (torque), the stiffness of the patient's joints while the legs are passively moved at 30, 60 and 90°/s, and PROM.                                                                                     |
| Indego (E) [28, 31]          | O    | O    | •    | —    | 113 kg | •    | ✤ Excessive energy expenditure due to a need for gait assistance devices such as crutches to help walk.  
      ✤ Present a frame and robotic actuators that attach to the patient's legs.  
      ✤ Joint movement is supported by electric motors.  
      ✤ Initiate by minimal bioelectrical signals detected via surface EMG electrodes measured in hip and knee extensor and flexor muscles.  
      ✤ Can be associated to treadmill and BWS.  
      ✤ Enables to help sitting, walking, and standing as well as sit-to-stand, stand-to-walk, walk-to-stand, and stand-to-sit transitions or sit with 100% powered robotic assistance.  
      ✤ Developed based on the user's ability to affect its center of pressure via the use of the upper body in combination with a stability aid.  
      ✤ Excessive energy expenditure due to a need for gait assistance devices such as crutches to help walk.  
      ✤ Height range 155 – 191 cm.  
      ✤ Maximum hip width 42.2 cm.  
      ✤ Femur length range 35 – 47 cm.  
      ✤ Spasticity score: Modified Ashworth score 3 or lower.  
      ✤ It is necessary sufficient upper body strength to balance and supports the forearms crutches, front-wheeled walker or platform walker.  
      ✤ For complete and incomplete spinal cord injured individuals T4 or below.  
      ✤ A Bluetooth LE radio allows communication between the Indego and iPhone or iPod touch through the custom Indego iOS application.  
      ✤ Patients can activate their core muscles and experience balance aspects.  
      ✤ Video monitor up front.  
      ✤ Allows lateral translation and transverse rotation of the pelvis.  
      ✤ Gait pattern is physiologic.  
      ✤ Compatible with pediatric orthoses.  
      ✤ Video monitor up front.  
      ✤ Used to measure isometric force (torque), the stiffness of the patient's joints while the legs are passively moved at 30, 60 and 90°/s, and PROM.                                                                                     |
| Lokomat FreeD Module (F) [19]| •    | •    | •    | 6    | 135 kg | O    | ✤ Patients can activate their core muscles and experience balance aspects.  
      ✤ Video monitor up front.  
      ✤ Allows lateral translation and transverse rotation of the pelvis.                                                                                                                   |
| LokomatPRO (without FreeD module) (G) [7, 10, 13, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50] | •    | •    | •    | 4    | 135 kg | O    | ✤ Video monitor up front.  
      ✤ Allows lateral translation and transverse rotation of the pelvis.                                                                                                                   |
<table>
<thead>
<tr>
<th>Model</th>
<th>Weight Limit</th>
<th>Height Limit</th>
<th>Gait Pattern Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOPES (H) [16, 17].</td>
<td>● ● ● 6  —  O</td>
<td>❖ Passive foot lifters can be added to keep dorsiflexion ankle.  ❖ Video monitor up front.  ❖ Severe contractures.  ❖ Bone instability.  ❖ Open skin lesions in the area of the lower limbs and torso.  ❖ Cardiac and circulatory contraindications  ❖ Severe cognitive deficits.  ❖ Hip, knee, ankle arthrodesis.</td>
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<td>Mindwalker (I) [15, 18].</td>
<td>O O ● 6 100 kg  ●</td>
<td>❖ Excessive energy expenditure due to a need for gait assistance devices such as crutches.  ❖ Patient height between 1.53 - 1.88 m.  ❖ Hip width up to 0.44 m.  ❖ Requires high load on the upper limb joints.  ❖ Can be associated to treadmill and BWS.  ❖ Initiate by minimal bioelectrical signals detected via surface EMG electrodes measured in hip and knee extensor and flexor muscles.</td>
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<tr>
<td>ReWalk (J) [21, 23, 26].</td>
<td>O O ● — 100 kg  ●</td>
<td>❖ Body height between 160 - 190 cm.  ❖ Gait pattern is not physiological.  ❖ Due to standing up/sitting down with the crutches, the device exerts pressure at the bend of the elbow and present risk of bruises.  ❖ Requires walking aids (crutches or a walker) to ensure stability and safety of the user.  ❖ The gait is a three-point pattern.  ❖ Present a battery unit, computer contained in a backpack, wireless mode selector, sensors that measure upper-body tilt angle, joint angles, and ground contact.  ❖ The exoskeleton is articulated to footplates distally and to a sacral band proximally.  ❖ Additional modes include sit-to-stand, stand-to-sit, up and down stairs.</td>
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</table>
The user will partially depend on crutches, or a walker to support their weight and maintain balance, joint angles and foot contact forces, which are often recorded to monitor basic gait performance.

- Exoskeleton and walker are placed at a convenient location suitable for walking (e.g. bedroom).
- Other robotic parts can be added by the user in the wheelchair.
- Robot can be folded into a roller bag and transported to anywhere.
- It can be used on uneven surfaces.

(*) Yes; (O) Not; (—) Not informed.