

Local Perceived Pressure Questionnaire

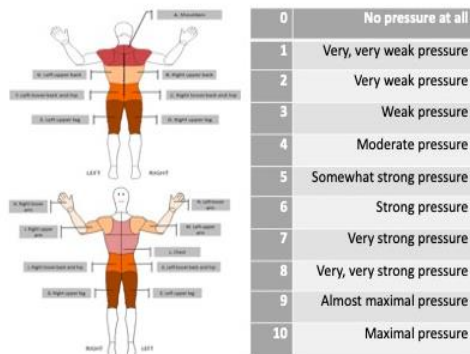
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EXPERIMENTER GUIDE



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Local Perceived Pressure Questionnaire Protocol Generalities

Generalities	Item	Template designer description																						
	Name	The questionnaire measures the subjective evaluation of musculoskeletal pressure applied by the exoskeleton to the user.																						
	Definition	The questionnaire measures the subjective evaluation of musculoskeletal pressure applied by the exoskeleton to the user.																						
	Image	 <p>The diagram shows a human figure with various pressure points labeled: Neck, Shoulder, Upper arm, Elbow, Forearm, Wrist, Hand, Hip, Knee, Ankle, and Foot. A pressure scale is provided on the right, ranging from 0 (No pressure at all) to 10 (Maximal pressure).</p> <table> <tr> <th>0</th> <th>No pressure at all</th> </tr> <tr> <td>1</td> <td>Very, very weak pressure</td> </tr> <tr> <td>2</td> <td>Very weak pressure</td> </tr> <tr> <td>3</td> <td>Weak pressure</td> </tr> <tr> <td>4</td> <td>Moderate pressure</td> </tr> <tr> <td>5</td> <td>Somewhat strong pressure</td> </tr> <tr> <td>6</td> <td>Strong pressure</td> </tr> <tr> <td>7</td> <td>Very strong pressure</td> </tr> <tr> <td>8</td> <td>Very, very strong pressure</td> </tr> <tr> <td>9</td> <td>Almost maximal pressure</td> </tr> <tr> <td>10</td> <td>Maximal pressure</td> </tr> </table>	0	No pressure at all	1	Very, very weak pressure	2	Very weak pressure	3	Weak pressure	4	Moderate pressure	5	Somewhat strong pressure	6	Strong pressure	7	Very strong pressure	8	Very, very strong pressure	9	Almost maximal pressure	10	Maximal pressure
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Keywords	Human factors; Comfort; Body pressure																							
Suitable Bipedal Systems	Lower-limbs exoskeletons																							
Associated PI Algo	LPP Algo																							
Estimated experimentation duration	~5 min.																							

Local Perceived Pressure Questionnaire Protocol

Protocol description	General description		
	Step	Description	Complementary information
	0 - Mandatory condition	The LPP Protocol has to be used after the participant has had the opportunity to try/use the exoskeleton.	
	1 - Instruction	The experimenter provides instructions to the participant.	The instruction will be: “We show you a picture that reports a human body divided into nine parts. Please, could you judge the degree of discomfort you felt for each part?”
	2 - data collection	The participant answers the questionnaire’s items.	LPP consists of 14 items rated on a Likert-type scale ranging from 0 (no pressure at all/no discomfort at all) to 10 (extremely strong pressure/extreme discomfort, almost maximum). A discomfort level of little discomfort is defined as the cut-off point for the peak discomfort measure. Mean ratings of perceived pressure are computed for each target body area and/or across body areas. Both round numbers and decimals can be used (up to the experimenter).

Perceived Local Musculoskeletal Pressure (LPP)

The Local Perceived Pressure method will be administered by the experimenter to the end-user after the completion of Single Task: Motor.

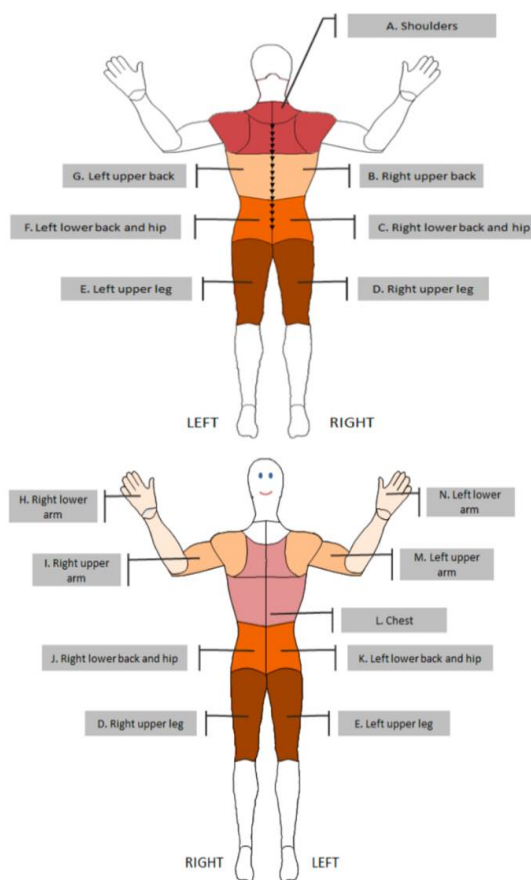
Also known as Localised Musculoskeletal Discomfort (LMD) method. It uses both numbers and verbal intensity descriptors to rate perceived musculoskeletal pressure (subjective evaluation of local discomfort). The ratings of localised perceived pressure indicate the levels of pressure that the device applies to the user. It can be related to a specific target body area (e.g., back, shoulders, upper legs, belly, hips, arms, chest, etc.).

Scoring: LPP is rated on a scale from 0 (no pressure at all/no discomfort at all) to 10 (extremely strong pressure/extreme discomfort, almost maximum). A discomfort level of little discomfort is defined as the cut-off point for the peak discomfort measure. Mean ratings of perceived pressure are computed for each target body area and/or across body areas. Both round numbers and decimals can be used (up to the experimenter).

LPP rated below 0.5 = extremely low pressure levels/extremely weak pressure/extremely little discomfort.

LPP rated below 2 = very low pressure levels/very weak pressure/minimal discomfort.

LPP Method



0	No pressure at all
1	Very, very weak pressure
2	Very weak pressure
3	Weak pressure
4	Moderate pressure
5	Somewhat strong pressure
6	Strong pressure
7	Very strong pressure
8	Very, very strong pressure
9	Almost maximal pressure
10	Maximal pressure

LPP Method Scoring Algorithm

$$\text{Back/Shoulders} = (A + B + C + F + G) / 5$$

$$\text{Arm} = (H + I + M + N) / 4$$

$$\text{Chest} = L / 1$$

$$\text{Belly/Hips} = (J + K) / 2$$

$$\text{Legs} = (D + E) / 2$$

*LPP benchmarking thresholds**

Min. score = 0

Max. score = 10

0 < low pressure < 3

4 < medium pressure < 5

6 < high pressure < 10

*Thresholds are considered per each body area.