

Identifying and Controlling the Wrong Sitting Posture



Someet Singh, Vanganur Sujith Kumar Reddy, Navjot Kaur, Anuj Jain

Abstract— *Sitting is one of the relaxing actions in our daily life. This paper proposes an experimental setup to find best sitting postures and also to analyze the appropriate time required for a particular sitting posture using IR sensors. IR sensors are used to find the posture of a human being, the sensors senses and send signals to AVR Microcontroller for analyzing the input and also it sends the output to another Microcontroller through wireless communication for correcting the posture.*

Keywords- *Sitting Posture, Sitting Time Limit, AVR, RF Module, Sensor*

I. INTRODUCTION

There have been demands in recent years for utilizing information technology to amend the quality of our circadian life. Sitting, standing and slumbering are the frequent reposing actions in our quotidian life. Sitting is one of the most mundane postures of human beings in life and receives incrementing attention in the medical community due to its extensive applications and paramount impacts.

A traditional method to analyze sitting posture is to let a patient sit on a hospital chair, and a therapist or a nurse observes the patient’s sitting posture and ask questions about his feeling. In general, the mundane diagnostic process will take half to one hour. However, it is still too short to obtain enough information for precise diagnosis. Furthermore, the diagnostic result has low reliability and can be partial by subjective factors from medicos to patients. For the sake of reliable diagnosis, medicos are alacritous to obtain more comprehensive information from patients. Ergo, it is indispensable to monitor patients 24/7 and offer the most comprehensive information for medicos. Camera is commonly used sensor for sitting posture analysis

1.1. Existing methodology

In the Existing methodology, the pressure sensors in the form of the cushion are used. The cushion was placed on the seat. When the people sit on the chair the cushion senses the input. The input sensed is depended on the threshold value. If the force is greater than the threshold value it is written as logic ‘1’, if not then logic ‘0’. It is an iterative process. The sensor used is simple binary value pressure sensor.

1.2. Hardware architecture of smart cushion

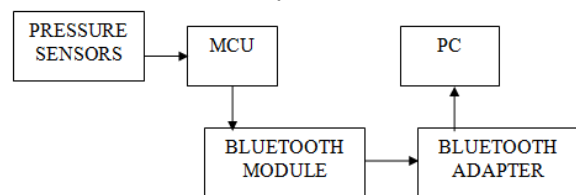


Figure 1: Hardware Architecture of Smart Cushion

The pressure sensors output is given to input of microcontroller unit and from the microcontroller to Bluetooth module and from Bluetooth module to the Bluetooth Adapter and to the PC. The data transfer is done by serial communication.

II. PROPOSED METHODOLOGY

The proposed model of a design involves sensors and AVR microcontroller. The sensors senses and gives the input to AVR microcontroller and this controller analyze the sensed data and give output to another microcontroller which is placed in front of a human.

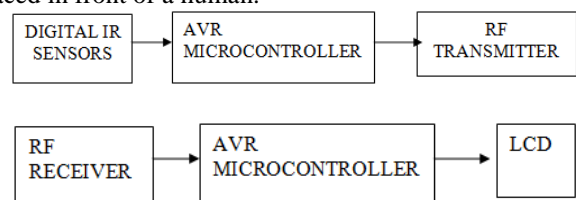


Figure 2: Transmitter and Receiver Side

2.1. Model of sensors placed in a chair



Figure 3: Model Chair

Sensors are placed at the four corners of the cushion for the back side of the chair and middle position at the down part of the chair.

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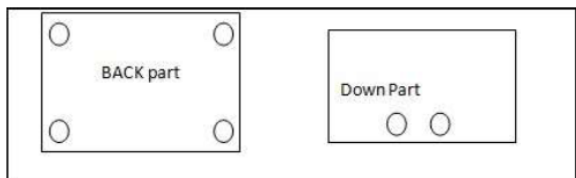


Figure 4: Arrangement of Sensors

- Through this design we can analyze different types of postures:
 - Normal Sitting
 - Left leg placed on right leg
 - Right leg placed on left leg
 - Relaxing
 - Bending

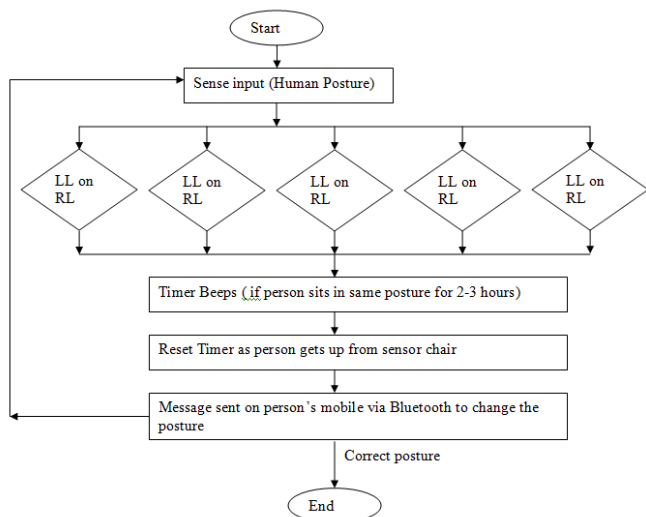
The time for each posture and temperature of the body is analyzed using the LM35 sensor. The LM35 temperature sensor is a precision centigrade scale.

- At the Transmitter side the digital IR sensors sense the input and give output (1 or 0) to AVR microcontroller and it does analysis and gives output to the encoder and to RF module.
- At middle position, there is a wireless Transmission communication.
- At the Receiver side, the RF module receives the signal sent by the transmitter, which decodes the input and gives decoded output to AVR Microcontroller for analysis. This further sends the data to display it on LCD.

III. PROPOSED ALGORITHM

- Step1: Sit in a comfortable manner as you like.
- Step2: System starts running.
- Step3: It checks your Posture.
- Step4: System will verify time limit and display what to do.
- Step5: Sensors on the chair Senses temperature.
- Step6: Recognize the muscle stress and the whole process will be repeated.

3.1. Flow chart



IV. RESULT AND ANALYSIS

The experiment of proposed system analysis is done on 3 different persons; their stress level is analyzed with the help of temperature sensor. The persons are sitting at different postures for 1 to 2 hours and measurement of their temperature at that position is done. In this study, we

recognized that temperature (or stress level) depends on their doing work. If your work is critical you feel more stress. The data was drawn between different person's temperature at different positions with and without experimental setup.

The main focus is on how the temperature is related to muscle stress and how it relates to blood pressure. The study of each and every posture let you know some of the stress caused diseases occur and the average time of each posture.

4.1. Normal sitting

4.1.1 Time vs temperature table

Table 1: Time vs. Temperature table for persons sitting (p1, p2, p3) without proposed system

S.NO.	TIME(Minutes)	Temperature(°C)		
		PERSON 1	PERSON 2	PERSON 3
1	0	35	37	34
2	30	35.2	37.4	34.5
3	45	35.6	37.6	35
4	60	36	37.8	35.8
5	90	36.2	38	36
6	105	37	38.7	37.5
7	120	37	38.8	38

4.1.2 Time vs temperature table with system

Table 2: Time vs. Temperature table for persons sitting (p1,p2,p3) with system

S.NO.	TIME(Minute)	Temperature(°C)		
		PERSON1	PERSON	PERSON3
1	0	35	37	34
2	30	35.2	37.4	34.5
3	45	35.6	37.6	35
4	60	35	36	34
5	90	35.1	36.8	34.2
6	105	35.5	37	34.5
7	120	35	36	33.8

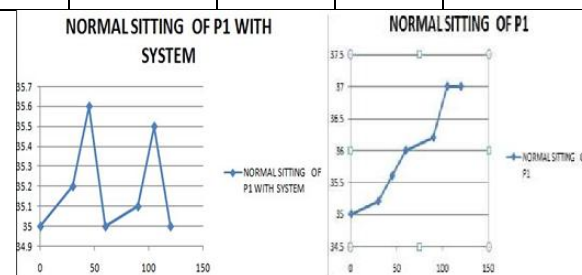


Figure 5(a): Time Vs Temperature of Persons P1 with and without system

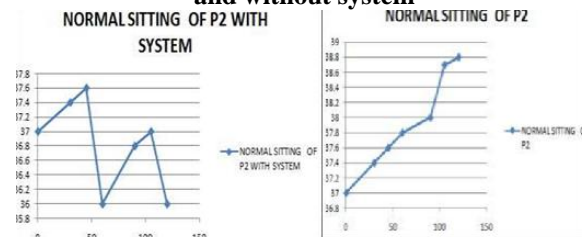


Figure 5(b): Time Vs Temperature of Persons P2 with and without system

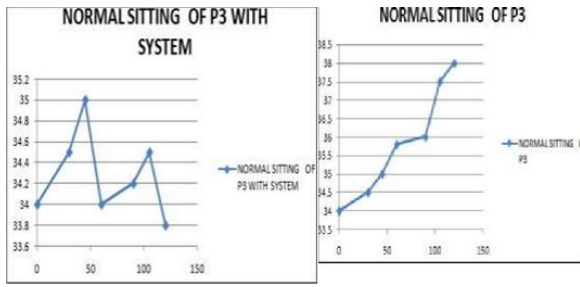


Figure 5(c): Time Vs Temperature of Persons P3 with and without system

4.2. RL placed on LL

4.2.1 Time vs temperature table

Table 3: Time vs. Temperature table for persons sitting (p1,p2,p3)RL placed on LL Without proposed system

S.NO	TIME(Minute)	Temperature(°C)		
		PERSON	PERSON	PERSON
1	0	34	37	35
2	30	35.1	37.3	35.5
3	45	35.9	38	36
4	60	36	38.1	36.7
5	90	36.2	38.7	37

4.2.2 Time vs temperature table with system

Table 4: Time vs. Temperature table for persons sitting (p1, p2, p3)RL placed on LL With system

S.NO	TIME(Minutes)	Temperature(°C)		
		PERSON	PERSON	PERSON
1	0	34	37	36
2	30	35.1	37.4	36.5
3	45	34.3	36.8	35
4	60	35	37	35.8
5	90	34	36	36

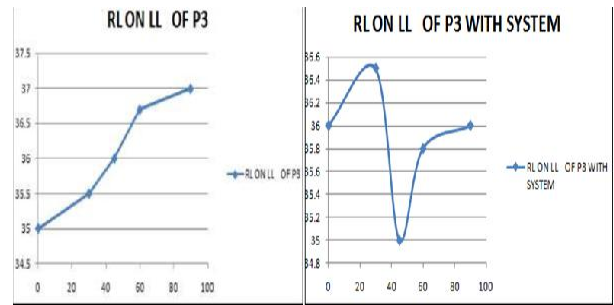


Figure 6(c): Time Vs Temperature of Persons P3 with and without system

4.3. LL placed on RL

4.3.1 Time vs temperature table

Table 5: Time vs. Temperature table for persons sitting (p1,p2,p3) LL placed on RL Without system

S.N	TIME(Minut)	Temperature(°C)		
		PERSO	PERSO	PERSO
1	0	34.8	37.3	34.5
2	30	35.1	37.8	36.5
3	45	35.9	38.1	37
4	60	36	39.1	37.7
5	90	36.2	39.7	38

4.3.2 Time vs temperature table with system

Table 6: Time vs. Temperature table for persons sitting (p1,p2,p3) LL placed on RL With system

S.NO	TIME(Minut)	Temperature(°C)		
		PERSO	PERSO	PERSO
1	0	34.7	37.8	36.5
2	30	35.1	37	37.5
3	45	34.3	36.8	35
4	60	35	37	35.8
5	90	34	36.2	36.3

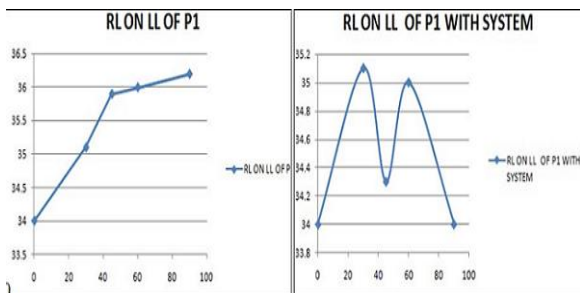


Figure 6(a): Time Vs Temperature of Persons P1 with and without system

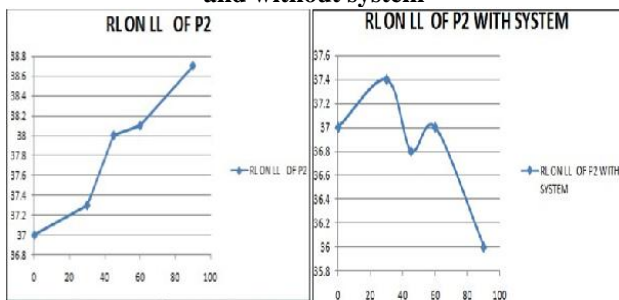


Figure 6(b): Time Vs Temperature of Persons P2 with and without system

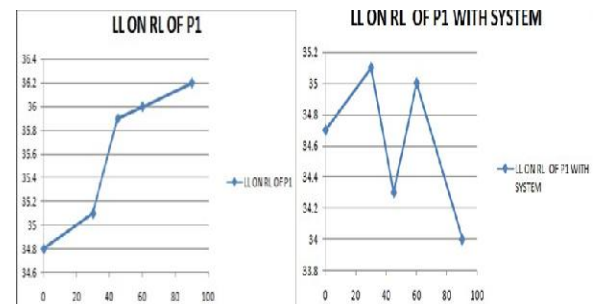


Figure 7(a): Time Vs Temperature of Persons P1 with and without system

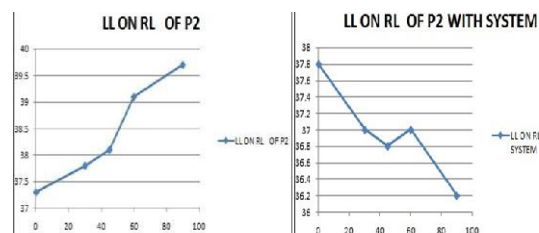


Figure 7(b): Time Vs Temperature of Persons P2 with and without system

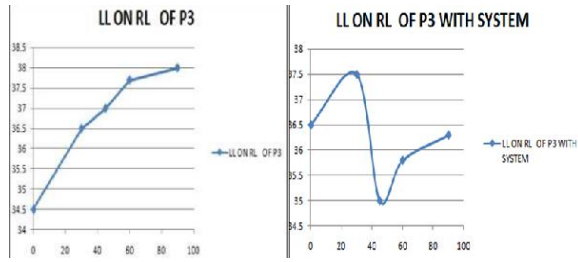


Figure 7(c): Time Vs Temperature of Persons P3 with and without system

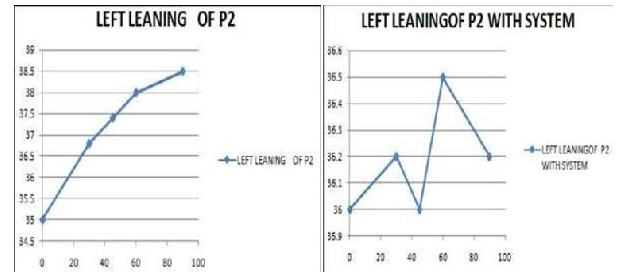


Figure 8(b): Time Vs Temperature of Persons P2 with and without system

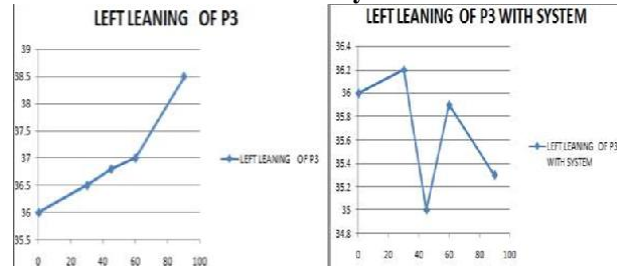


Figure 8(c): Time Vs Temperature of Persons P3 with and without system

4.4. Left-leaning

4.4.1 Time vs temperature table

Table 7: Time vs. Temperature table for persons sitting (p1,p2,p3) LEFT LEANING Without system

S.NO	TIME(Minut)	Temperature(^o C)		
		PERSO	PERSO	PERSO
1	0	33	35	36
2	30	35.1	36.8	36.5
3	45	35.9	37.4	36.8
4	60	36	38	37
5	90	36.8	38.5	38.5

4.4.2 Time vs temperature table with system

Table 8: Time vs. Temperature table for persons sitting (p1,p2,p3) LEFT LEANING With system

S.N	TIME(Minut)	Temperature(^o C)		
		PERSO	PERSO	PERSO
1	0	35	36	36
2	30	35.6	36.2	36.2
3	45	34	36	35
4	60	35.5	36.5	35.9
5	90	34.6	36.2	35.3

4.5. Right-leaning

4.5.1 Time vs temperature table

Table 9: Time vs. Temperature table for persons sitting (p1, p2, p3) LEANING RIGHT Without system

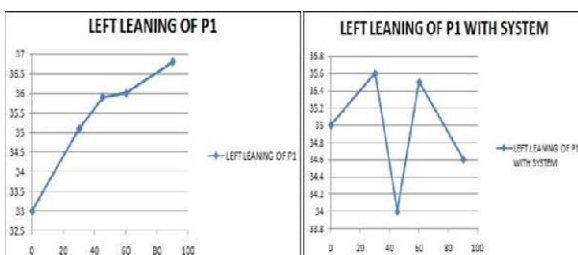
S.N	TIME(Minut)	Temperature(^o C)		
		PERSO	PERSO	PERSO
1	0	34	36	37
2	30	34.1	36.5	37.5
3	45	34.5	37	37.8
4	60	35	37.4	38
5	90	35.5	38.3	38.6

4.5.2 Time vs temperature table with system

Table 10: Time vs. Temperature table for persons sitting (p1, p2, p3) LEANING RIGHT With system

S.NO	TIME(Minut)	Temperature(^o C)		
		PERSO	PERSO	PERSO
1	0	34.2	35.8	34.7
2	30	34.5	36	35.2
3	45	34	35.7	35
4	60	34.5	36.2	35.7
5	90	33	35.6	35.3

Figure 8(a): Time Vs Temperature of Persons P1 with and without system



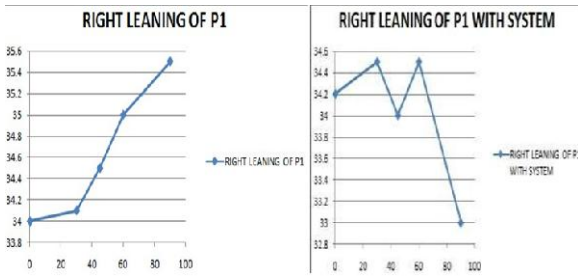


Figure 9(a): Time Vs Temperature of Persons P1 with and without system

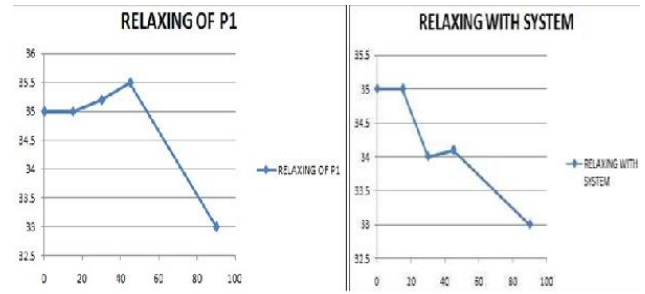


Figure 10(a): Time Vs Temperature of Persons P1 with and without system

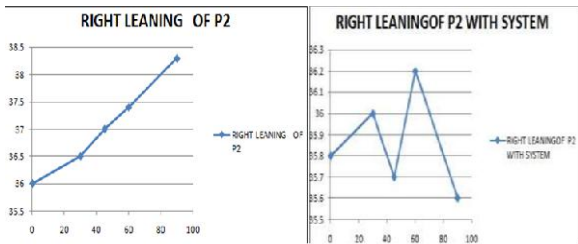


Figure 9(b): Time Vs Temperature of Persons P2 with and without system

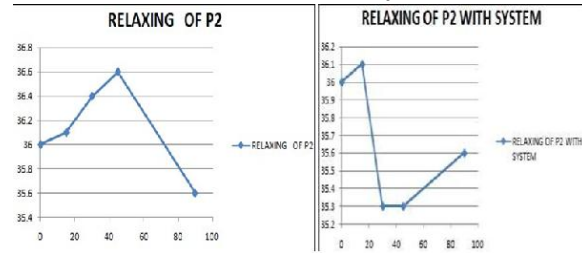


Figure 10(b): Time Vs Temperature of Persons P2 with and without system

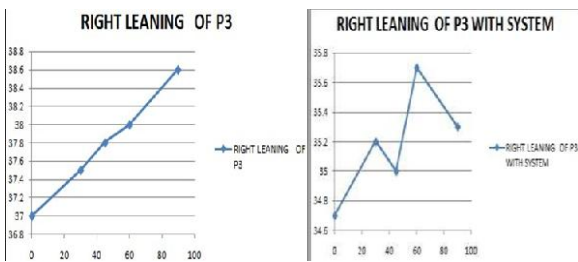


Figure 9(c): Time Vs Temperature of Persons P3 with and without system

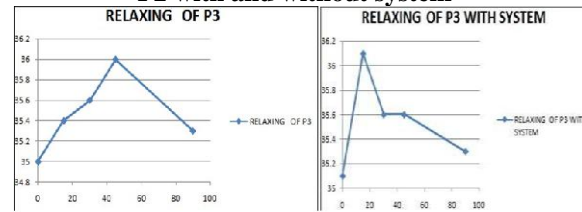


Figure 10(c): Time Vs Temperature of Persons P3 with and without system

4.6. Relaxing

4.6.1 Time vs temperature table

Table 11: Time vs. Temperature table for persons sitting (p1, p2, p3) Relaxing Without system

		TEMPERATURE(°C)		
S.NO	TIM	PERSON	PERSON	PERSON
1	0	35	36	35
2	15	35	36.1	35.4
3	30	35.2	36.4	35.6
4	45	35.5	36.6	36

4.6.2 Time vs temperature table with system

Table 12: Time vs. Temperature table for persons sitting (p1, p2, p3) Relaxing With system

		TEMPERATURE(°C)		
S.NO	TIM	PERSON	PERSON	PERSON
1	0	35	36	35.1
2	15	35	36.1	36.1
3	30	34	35.3	35.6
4	45	34.1	35.3	35.6

4.7. Bending

4.7.1 Time vs temperature table

Table 13: Time vs. Temperature table for persons sitting (p1, p2, p3) Bending without system

		TEMPERATURE(°C)		
S.NO	TIME	PERSON	PERSON	PERSON
1	0	36	36	35
2	15	36.5	36.4	35.4
3	30	37	37.5	37
4	45	37.6	37.9	37.4

4.7.2 Time vs temperature table with system

Table 14: Time vs. Temperature table for persons sitting (p1, p2, p3) Bending With system

		TEMPERATURE(°C)		
S.NO	TIM	PERSO	PERSO	PERSO
1	0	35	36	35
2	15	33	35.8	35.4
3	30	35.6	37	36.1
4	45	35	36	35.5

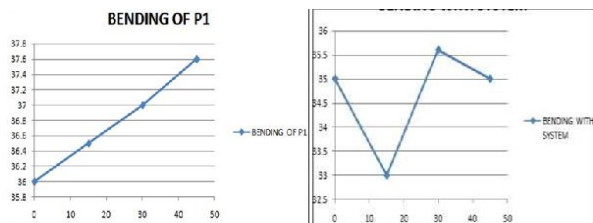


Figure 11(a): Time Vs Temperature of Persons P1 with and without system

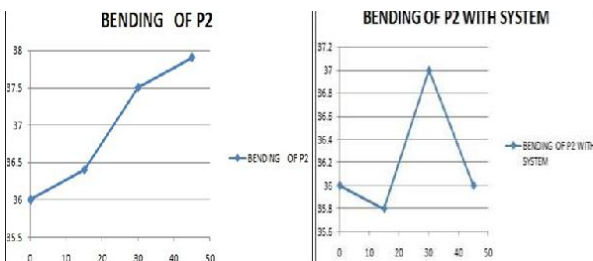


Figure 11(b): Time Vs Temperature of Persons P2 with and without system

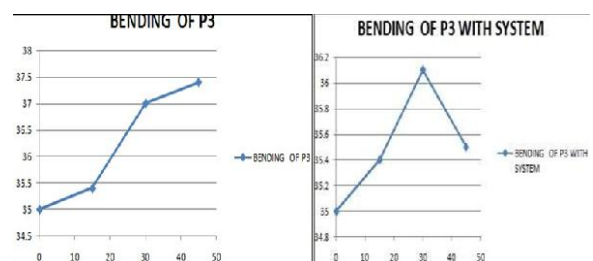


Figure 11(c): Time Vs Temperature of Persons P3 with and without system

V. Conclusion

From above analysis, we reached the conclusion that in which postures a person is sitting, body temperature with and without my system and we also related temperature with muscle stress. If the temperature is increasing the stress on that part is high. Time to rectify each posture is also specified. Average values of the maximum and minimum time range of each posture are calculated. The maximum time is for how long a person can sit on a chair without any adverse effects and the minimum time specifies the time after which a person should change the posture.

Table 15: Time Range of each Posture

Posture	Time	
	Max	Min
Normal	120minute	45minutes
LL ON RL	90minutes	30minutes
RL ON LL	90minutes	30minutes
Left Leaning	75minutes	15minutes
Right Leaning	75minutes	15minutes
Relaxing	180minute	120minutes
Bending	45minutes	15minutes

Future Scope

In this paper posture of human being and muscle stress from temperature is analyzed. The scope of this experiment can be extended to find the health issues caused by a wrong sitting posture as well as sleeping posture.

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