

Experiment HP-5: Heart Rate, Blood Pressure, and Vagal Tone

Personality and Vagal Tone Section

***Note:** If you choose to do Heart Rate, BP, Vagal Tone or Vigilance-Reaction Time experiments – choose those labs from the Human Psychophysiology section.*

Exercise 1: Personality and Vagal Tone

Aim: To test a hypothesis that persons with high perceived shyness and behavioral inhibition have lower Vagal tone than persons with low perceived shyness. Vagal tone is measured as the difference between the maximum and minimum heart rates of the subject during normal breathing.

Procedure

1. Instruct the subject to sit quietly and breathe normally before and during the recordings to prevent the creation of motion artifacts. The subject should sit erect so that the muscles involved in pulmonary ventilation are able to move without restriction.

***Warning:** Stop the experiment if the subject feels dizzy or nauseated.*

2. Type Normal Breathing <Subject's Name> in the Mark box to the right of the Mark button.
3. Click Record. Press the Enter key on the keyboard. Click AutoScale for all four channels. Record the subject's breathing and heart rates for at least one minute.
4. Click Stop to halt recording.
5. Select Save in the File menu.

Data Analysis

1. Scroll through the data file and find the recording of the subject's heart and breathing rates while breathing normally.
2. Use the same techniques explained in the Heart Rate-BP lab to adjust the Display Time of the Main window to show an artifact-free section of data containing five breath cycles in the Main window.
3. Click on the Analysis window icon in the toolbar or select Analysis from the Windows menu to transfer the data displayed in the Main window to the Analysis window ([Figure HP-5-L1](#)).
4. On the Respiration channel, click and drag one cursor to the beginning of the first breath cycle displayed in the Analysis window ([Figure HP-5-L1](#)). Drag the other cursor to the beginning of the second breath cycle and measure the following:
 - Maximum Heart Rate. The value for Max on the Heart Rate channel is the subject's maximum heart rate during the first breath cycle.
 - Minimum Heart Rate. The value for Min on the Heart Rate channel is the subject's minimum heart rate during the first breath cycle.

- Mean Heart Rate. The value for Mean on the Heart Rate channel is the subject's mean heart rate during the first breath cycle.

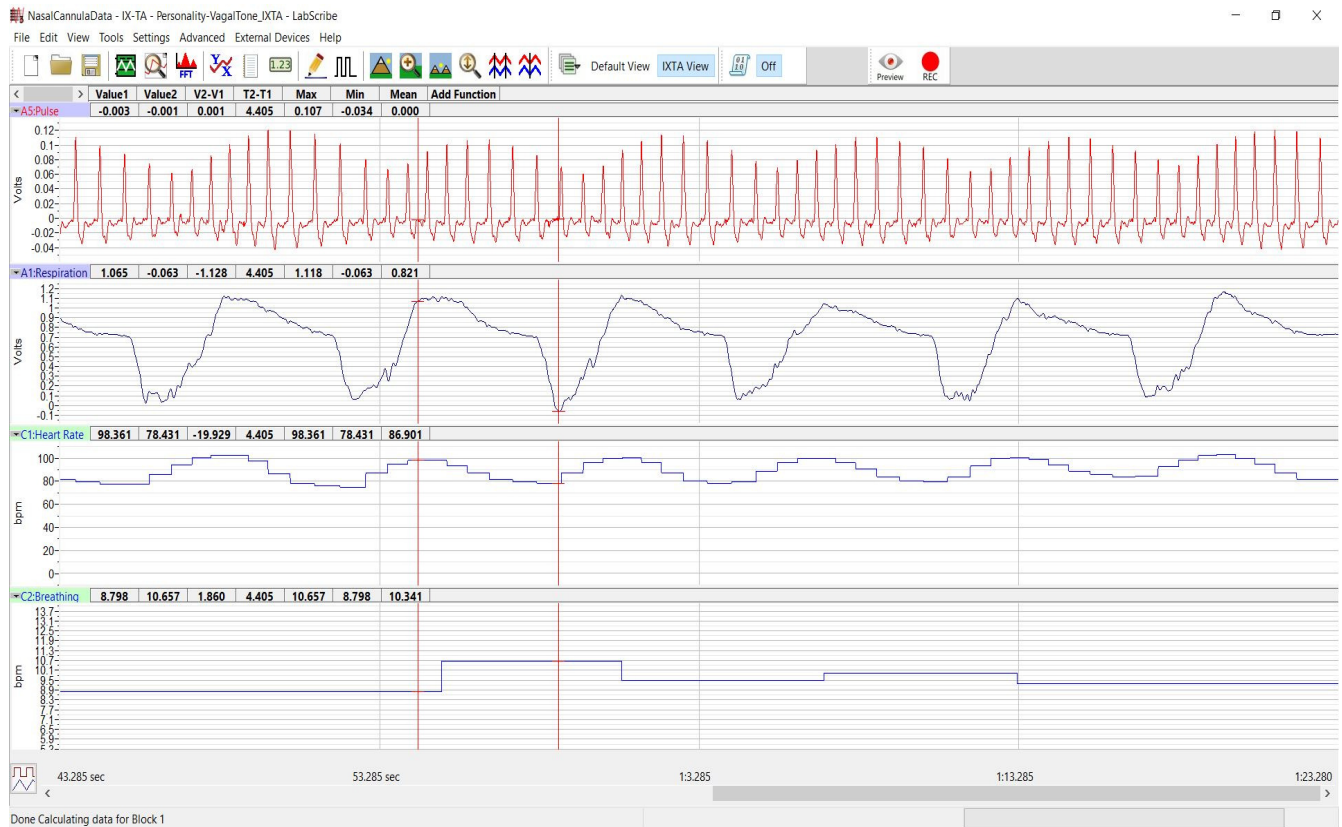


Figure HP-5-L1: The pulse wave, respiration, heart rate, and breathing rate recordings of a subject using abdominal breathing while at rest are displayed, from top to bottom, in the Analysis window. On the respiration channel, inhalation is displayed as an upsweep. Notice that the heart rate goes up during inhalation.

- Record the values for these rates in the Journal using one of the techniques described in the Heart Rate-BP section of this lab, and in [Table HP-5-L1](#).
- On the Respiration channel, leave one cursor at the beginning of the second breath cycle. Click and drag the other cursor to the beginning of the third breath cycle displayed in the Analysis window.
- Repeat Steps 4 and 5 for the second breath cycle.
- Move the cursors to the beginning and end of each of the three remaining breath cycles and repeat Steps 4 and 5 for each breath cycle
- Determine the means of the maximum and the minimum heart rates for the five breaths. Enter these values in [Table HP-5-L1](#).

Table HP-5-L1: Heart Rate Variation during Normal Breathing

Subject	Heart Rate (BPM)			Breath Rate (BrPM)
	Max	Min	Δ	
Breath 1				
Breath 2				
Breath 3				
Breath 4				
Breath 5				
Mean				

10. Determine the difference (Δ) between the mean maximum and mean minimum heart rates and enter this value in [Table HP-5-L1](#). This difference, which will be used to measure Vagal tone, is also known as the respiratory sinus arrhythmia (RSA) prominence.
11. On the Respiration channel, click and drag one cursor to the beginning of the first breath cycle. Click and drag the other cursor to the end of the fifth breath cycle displayed in the Analysis window and measure the Mean Breath Rate. The value for Mean on the Breath Rate channel is the subject's mean breath rate over the five consecutive breath cycles.
12. Record the value for this rate in the Journal using one of the techniques described in Exercise 1, and in the data table.
13. Have the subject answer the questions in the shyness/behavioral inhibition questionnaire in [Table HP-5-L2](#).

Questions

1. What is the value for the Vagal tone of the subject? What percentage of the mean minimum heart rate is the value for the Vagal tone?
2. How does the Vagal tone of this subject compare to the subject's score on the shyness/behavioral inhibition questionnaire?
3. How does the Vagal tone of this subject compare to those of other subjects? When the Vagal tones and shyness scores of all the subjects are compared, is there a correlation between shyness/behavioral inhibition and Vagal tone?
4. Does any other factor besides shyness or inhibition affect Vagal tone?

Table HP-5-L2: Shyness/Behavioral Inhibition Questionnaire*

Question	
How often do you experience awkwardness or discomfort in the following situations?	Score (0-4)
1. At a party	
2. On a dinner date	
3. In a class discussion when expected to contribute.	
4. In an uncrowded elevator.	
5. When introduced to someone.	
6. In a study group.	
7. When asked to introduce yourself in class.	
8. When asking someone out for coffee (tea, soda, etc.)	
9. When asking for notes from a classmate after an absence.	
10. When speaking to a professor.	
How often do you have difficulty actually doing (taking action on) the following?	Score (0-4)
11. Making and sustaining eye contact in a conversation.	
12. Initiating a conversation with persons you do not know well.	
13. Disagreeing with someone.	
14. Asking a question in class.	
15. Making small talk.	
16. Asking directions or help.	
17. Calling people on the phone to invite them over.	
18. Giving aide or attention to someone in distress.	
19. Seeking information from others about class assignments.	
20. Telling someone he or she is bothering you.	
TOTAL	
* Ratings: 0=never, 1=rarely, 2=occasionally, 3=often, 4=almost always. The total score is the sum of the ratings for all 20 questions	

References

- Cole, P. M., Zahn-Waxler, C., Fox, N. A., Usher, B. A., & Welsh, J. D. (1996). Individual Differences in Emotion Regulation and Behavior Problems in Preschool children. *Journal of Abnormal Psychology*, 105(4), 518-529.
- Eisenberg, N., Fabes, R. A., Karbon, M., Murphy, B. C., Carlo, G., & Wosinski, M. (1996). Relations of School Children's Comforting Behavior to Empathy-related Reactions and Shyness. *Social Development*, 5(3), 330-351.
- Harris, R. M., Porges, S. W., Carpenter, M. E., & Vincenz, L. M. (1993). Hypnotic Susceptibility, Mood State, and Cardiovascular Reactivity. *American Journal of Clinical Hypnosis*, 36(1), 15-25.
- Jemerin, J. M. & Boyce, W. T. (1990). Psychobiological Differences in Childhood Stress Response. II. Cardiovascular Markers of Vulnerability. *Journal of Developmental Behavioral Pediatrics*, 11(3), 140-150.
- Kagan, J., Reznick, J. S., & Snidman, N. (1987). The Physiology and Psychology of Behavioral Inhibition in Children. *Child Development*, 58, 1459-1473.
- Lane, J. D., Adcock, R. A., & Burnett, R. E. (1992). Respiratory Sinus Arrhythmia and Cardiovascular Responses to Stress. *Psychophysiology*, 29(4), 461-470.
- Porges, S. W. (1992). Vagal tone: A Physiological Marker of Stress Vulnerability. *Pediatrics*, 90(3), 498-504.
- Thayer, J. F., Friedman, B. H. & Borkovec, T. D. (1996). Autonomic Characteristics of Generalized Anxiety Disorder and Worry. *Biological Psychiatry*, 39(4), 255-266.