

EFFECT OF NATUROPATHIC TREATMENT –FULL WET SHEET PACK ON AUTONOMIC VARIABLES IN HEALTHY VOLUNTEERS

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Abstract: Full wet sheet pack is one of the naturopathic treatment modality where person is enveloped with cold wet wrapping upon that dry wrapping to prevent evaporation. So this study aims to evaluate the physiological changes of full wet sheet pack on autonomic variables in healthy individual. 60 healthy volunteers of both genders were recruited for the study. Intervention was given for 45 minutes. Assessments for autonomic variables (Heart rate variability, Respiratory rate, Digit pulse volume, Blood pressure and Temperature) were done 5 minutes before and 5 minutes immediately after the treatment. Data was checked for normal distribution and analysed by using paired t test and Wilcoxon matched pair test with SPSS (Version 21.0) package. In this study comparison of pre and post variables following full wet sheet pack showed there is increase in RMSSD, NN50, PNN50, HF, mean RR and slight changes in RR, VLF, PR is noticed. Whereas HR, LF, LF/HF ratio, SBP, DBP, and Temperature readings were decreased after full wet sheet pack. So application of full wet sheet pack on the body enhances parasympathetic activity which has relaxing and calming effect.

Index Terms: Naturopathy, Heart Rate, Blood pressure, Temperature, Pulse rate

I. INTRODUCTION:

Naturopathy is a science of healthy living. It is distinct system of primary health care an art, science, philosophy and practice of diagnosing treatment and prevention of illness based on the principles.¹This system consists of non- invasive treatment modalities like diet therapy, fasting therapy, mud therapy, massage therapy hydrotherapy, air therapy, chromo therapy and magneto therapy. It lays more importance on the preventive aspect of health care rather than curative one. Hydrotherapy is the branch which uses water as a treatment modality for treating various diseases.²Wet sheet pack or Packing therapy is a full body wrap i.e. enveloping the body with cold wet sheet and preventing evaporation by careful protection with dry wrappings.³This is extremely useful and widely applicable hydratic procedure, generally accredited to Priessnitz, was invented and first used by Lucas, in 1750. The physiological changes and therapeutic benefits of full wet sheet pack is observed in four phases a) Cooling phase – used as antipyretic, b) Neutral phase –sedative effect c) Heating phase – derivative effect and sudorific d) Sweating phase – spoliative and eliminative effect. This therapy is very much useful in toxemia connected with dyspepsia, diabetes, nervous disorders, general paresis, delirium and febrile conditions.^{3,4}Some clinical trials were done on wet sheet pack with severe aggressive behaviours in children and adolescents hospitalized in a psychiatric setting is found very effective by operating sensory integration i.e. by adaptation response which is defined as a purposeful, goal-directed response to a sensory experience and with that relaxation is noticed.^{5,6}An article by John Broom M.D Clifton showed that wet sheet pack is valuable in treatment of some forms of delirium tremors.⁷Hence this study is undertaken to evaluate the physiological effects of Full wet sheet pack on autonomic variables in healthy volunteers.

II. METHODOLOGY

Participants: Sixty healthy volunteers of ages ranging between 18 to 28 years were recruited based on inclusion and exclusion criteria.

Study group: Students from Sri Dharmasthala Manjunatheshwara (SDM) College of Naturopathy and Yogic Sciences, Ujire, Dakshina Karnataka were recruited for the study. A signed informed consent in English language was obtained from each individual. Institutional Ethical Committee approved the study. Intervention was given for 45 minutes. Assessments were done five minutes before and five minutes immediately after the intervention.

Inclusion criteria: The subjects were found to be healthy based on routine medical examination conducted by a physician. Both genders were recruited. Participants who were willing to participate in the study by signed informed consent form were taken.

Exclusion criteria: Subject with open wounds. Females under menstruation.⁸ Subject with any history of medical illness. E.g. those who were taking medication for common cold which could influence autonomic function (phenylpropanolamine) .⁹ Patients who are consuming alcohol and smoking prior to beginning of study. Weak and debilitating persons.

Study Design: Single pre– post experimental study.

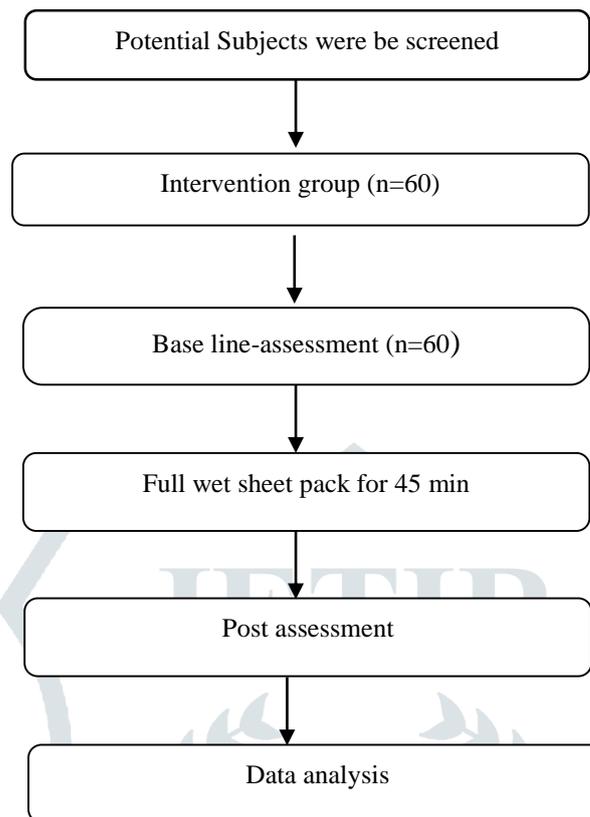


Figure: 1 Illustration of study plan

ASSESSMENTS: Condition of recordings: The subjects were seated on a chair recording leads were connected to the four-channel polygraph equipment (BIOPAC, Montana, USA; model No: BSL 4.0 MP 36) and monitored on a closed circuit TV. Instructions were given to the subjects to remain relatively undisturbed during the session.

INTERVENTION⁴: Requisites: one large blanket, one small blanket, two large sheets, one of which should be linen, towel.

Temperature: water at temperature of 60^oF to 70^oF (15.6^oC to 21.1^o C).

A sheet is folded once lengthwise and laid across the couch. The double blanket is placed on the sheet so that one end hangs on the side opposite to the patient. Then the linen sheet should be wrung out by two persons and spread on the blanket. Now the patient should lie on the sheet and asked to raise his hands above the head and draw one side of sheet across the body and tuck it along the side of body. Now again ask the patient to lower his arms and other side of sheet across the patient is tucked and farther end of blanket is drawn across the patient and tucked under the body. The longer end of blanket is tucked on other side along the length of the body. Now the blanket should be doubled under the foot and dry sheet is brought around the shoulders and tucked. One woollen blanket is to be placed lengthwise upon the patient and proper care should be taken.

DATA EXTRACTION: From the digitized ECG data, the R waves are detected to obtain a point event series of successive R-R intervals, from which beat to beat heart series were computed. The data recorded was visually inspected off-line and only noise free data was included for analysis.

- Heart rate and heart rate variability (HRV):** The heart rate in beats per minute was calculated by counting the R waves of the QRS complex in the EKG in successive epochs of 60 seconds and averaged for each 5-minute block period. The HRV power spectrum was obtained using fast Fourier transform analysis (FFT). The energy in the HRV series of the following specific bands was studied, viz., the very low frequency component (0.0-0.05 Hz), low frequency component (0.05-0.15 Hz), and high frequency component (0.15-0.50 Hz). The low frequency and high frequency values were expressed as normalized units, which represent the relative of each power component in proportion to the total power minus VLF component [$LF \text{ norm} = LF / (\text{total power} - VLF) \times 100$; $HF \text{ norm} = HF / (\text{total power} - VLF) \times 100$] for a typical trace of HRV spectrum¹⁰.
- Respiratory rate:** Readings were obtained for every 60 seconds as number of cycles per minute. The readings were averaged for each five-minute block period¹¹.
- Digital pulse volume:** For this recording, the transducer was placed on the volar surface of the digital phalanx of the left thumb to record the digital pulse volume (DVP), also called the finger plethysmogram. Photoplethysmography allowed normal non-invasive recording of arterial blood volume pulse. The changes in the absorption of light by hemoglobin using wave forms. The amplitude of the DVP was sampled from the peak of the pulse waves at 30-second intervals and presented in mm¹¹.
- Blood pressure:** The blood pressure was recorded with a sphygmomanometer by auscultation over the right brachial artery.¹²
- Body temperature:** The Mercury-in-glass thermometers have been used as a standard tool to measure the temperature since 1867.¹³ The body temperature will be recorded with a thermometer by placing under left axillary arm pit.

DATA ANALYSIS: The data will be analyzed using a Statistical Package for Social Sciences (SPSS) version 21.0. Significance was determined with $p \leq 0.05$. To see normality distribution Kolmogorov Smirnov test was applied. The mean, standard deviation and p-values were calculated for all the variables by using Paired t test and Wilcoxon matched pair test.

III. RESULTS

The data obtained following full wet sheet pack were analysed for normality assumption by using Kolmogorov Smirnov test. Results shows that except mean RR, HF, LF/HF, SBP, DBP, and Temperature scores didn't follow normal distribution was analysed by Wilcoxon matched paired test. Whereas the variables HR, RR, PR, RMSSD, NN50, PNN50, VLF, LF scores which follow normal distribution was analysed by paired t-test was applied.

Table: 1 Comparison of variables following Full wet sheet pack by applying Paired test

TIME POINTS	MEAN PRE \pm SD	MEAN POST \pm SD	P VALUE
mean HR	73.69 \pm 8.49	68.71 \pm 8.04	0.001*
RR	15.43 \pm 1.60	15.48 \pm 1.35	0.822
PR	85.84 \pm 1.24	85.37 \pm 2.62	0.237
RMSSD	52.11 \pm 27.83	60.25 \pm 32.62	0.013*
NN50	90.92 \pm 73.10	111.32 \pm 69.00	0.001*
PNN50	23.58 \pm 18.13	32.78 \pm 20.49	0.001*
VLF	34.16 \pm (19.08)	35.71 \pm 17.08	0.580
LF	57.21 \pm (18.16)	50.79 \pm (18.75)	0.002*

*Represents significant ($*p < 0.0$)

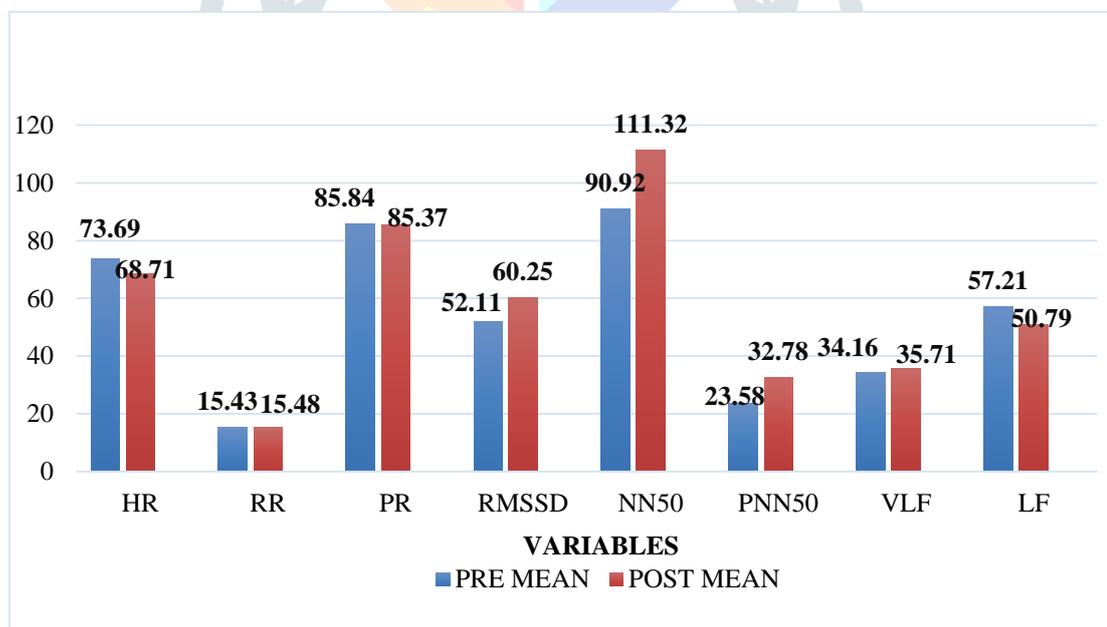


Figure 2: Comparison of variables following Full wet sheet pack by applying Paired test

In table 1 and figure 2: Results comparing pre and post variables after Full wet sheet pack showed decrease in mean HR, LF scores whereas the variables RMSSD ($P=0.013$), NN50, PNN50 shows increase in their scores. Slight changes were noticed in RR, VLF and PR. Based on the above results mean RR, LF, RMSSD, NN50, PNN50 scores are statistically significant i.e. $P < 0.001$.

Table: 2 Comparison of variables following full wet sheet pack by applying Wilcoxon matched pair test

TIMEPOINTS	PRE MEAN ±SD	POST MEAN ±SD	P VALUE
mean RR	810.05 ± 120.56	877.58 ±143.99	0.001*
HF	42.63 ± 20.44	50.63 ± 18.58	0.001*
LF/HF	2.12 ± 2.24	1.45 ± 1.66	0.001*
SBP	113.50 ± 9.75	104.37 ± 10.58	0.001*
DBP	78.28 ± 10.47	73.30 ± 10.49	0.001*
TEMP	97.99 ± 2.79	97.89 ± 0.47	0.001*

*Represents significant (*p<0.05)

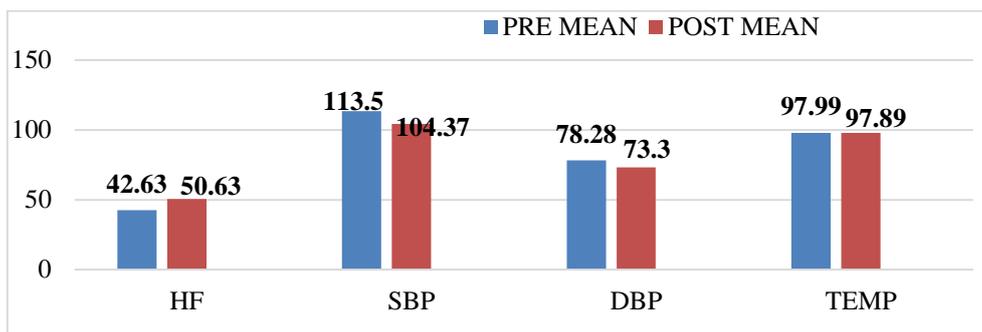


Figure: 3 Comparison of variables following full wet sheet pack by applying Wilcoxon matched pair test

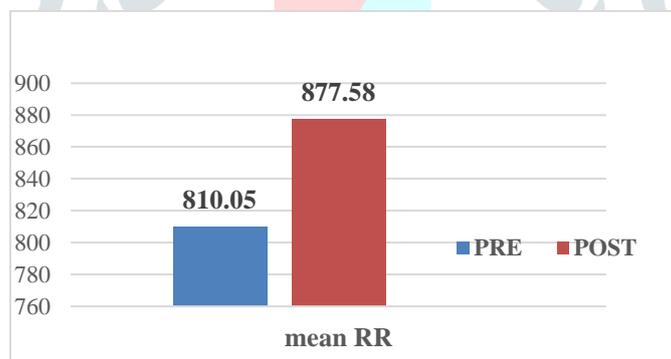


Figure - 4: Pre and Post changes in mean RR

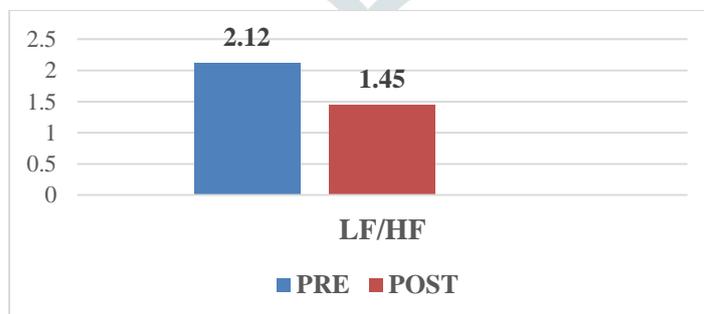


Figure-5: Pre and Post changes in LF/HF ratio scores

In table and figure 3,4,5 : Results after applying full wet sheet pack showed there is decrease in LF/HF, SBP, DBP and TEMP scores whereas increase in mean RR, HF is noticed. All these variables by applying Wilcoxon matched pair test showed statistically significant i.e. P<0.05.

IV. DISCUSSION:

This study evaluated the effect of naturopathic treatment modality - Full wet sheet pack on autonomic variables (HRV, RR, PR, BP, and Temperature). All the 60 subjects underwent intervention for 45 min in sleeping posture and there was no adverse effects reported during or after intervention. Results of individuals who underwent FWP showed decrease in mean HR ($P=0.001$), LF ($p=0.002$), LF/HF ($p=0.001$), SBP ($p=0.001$), DBP ($p=0.001$), Temperature ($p=0.001$) and slight changes in RR, VLF PR after the treatment. Whereas mean RR ($p=0.001$), HF ($p=0.001$), RMSSD ($p=0.013$), PNN50 ($p=0.001$), NN50 ($p=0.001$) scores were increased. The significance changes observed is suggestive of parasympathetic dominance i.e. shift in Sympathovagal balance.

A Study shows that cold water immersion induces parasympathetic reactivation. Cold water immersion is a better strategy to increase parasympathetic activity. At rest, the equilibrium between the two branches of the ANS confers cardio protective back acts on heart rate. Cold stimulation triggers peripheral vasoconstriction, leading to a shift in blood volume towards the core.¹⁴ Hence in our study cold temperature when exposed to skin, initially it causes vasoconstriction, followed by dilatation of the peripheral blood vessels as a secondary reaction. So activation of cold receptors and thereby results in increase in vagal related HRV indices. According to another study, superficial cold receptors that are innervated by the ophthalmic branch of the trigeminal nerve would enhance the cardio vagal activity.¹⁵ Hence in our study superficial cold receptors could have played a role in getting feeling of calmness which is suggestive of increasing parasympathetic activity.

Another study evaluated the immediate effects of cold spinal bath in subjects with hypertension. There was a significant decrease in blood pressure (SBP and DBP) in hypertensive immediately after cold spinal bath. The significant reduction in heart rate observed is suggestive of parasympathetic dominance immediately after the intervention. This fact is further supported by the findings observed in the components of HRV. Perhaps reduction in LF component, LF/ HF ratio and increase in HF component, are all suggestive of a shift in Sympathovagal balance towards parasympathetic dominance (increase in vagal activity). In addition, the changes observed in blood pressure provide a clear direction to the effects of spinal bath.¹⁶ So in this study after the treatment by comparing showed significant reduction in LF component, LF/HF ratio and increase in HF component with support of other parameters shows there is increase in vagal activity and shift in sympathetic activity.

Miyamoto and his associates has illustrated the effects of water immersion as simple and efficient method for increasing parasympathetic activity .The hydrostatic pressure created by head out immersion shifts peripheral blood volume, stroke volume, cardiac output.¹⁷ Similarly whole body is wrapped tightly in a wet sheet pack suggest to have parasympathetic activity while above mechanism may support the results observed in the present study. Since the physiological changes following FWP are not documented so far, the present study made an attempt to understand the physiological effects of FWP. It can be speculated from the results of the present study that, changes are mediated not only through sympatho-vagal changes, but also influenced by humoral factors.

Limitations of the study:

1. Experimental design was without control group
2. Physiological changes during each stage was not assessed.

Directions for future research:

1. Assessments should be done according to stages
2. Conducting study with a larger sample size.
3. Skin conductance in the form of GSR can be included.

V. CONCLUSION:

Application of full wet sheet pack on the body enhances parasympathetic activity based on significant results in the autonomic nervous system with sensory integrative effect and a holding effect (relaxation). Hence full wet sheet pack can be applied effectively to treat stress, insomnia and anxiety, fever etc.

Abbreviations: SD=Standard deviation, HR=Heart rate, RR=Respiratory rate, PR=Pulse rate, mean RR= Mean of R-R interval, RMSSD=The square root of the mean squared difference between adjacent N-N intervals, NN50=Consecutive normal sinus (NN) intervals exceeds 50 ms, pNN50=The fraction of consecutive NN intervals that differ by more than 50 ms, VLF=Very low frequency power, LF=Low frequency Power, HF=High frequency power, LF/HF=Low frequency/High frequency ratio, SBP=Systolic blood pressure, DBP=Diastolic blood pressure and TEMP =Temperature.

Competing Interests: The authors declare that they have no competing interests

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