

NST-NAET® Reliability Study

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ABSTRACT

Objective: This study was conducted to examine the precision of the NST-NAET® (Neuromuscular Sensitivity Testing of Nambudripad's Allergy Elimination techniques) in repeated performances. The NST-NAET® was also studied to determine its reliability among randomly selected examiners about the accuracy of their own performances in testing.

Study Design and Methodology: This study used a sample of both experienced and inexperienced practitioners in a totally blinded and randomized testing environment. Seven NAET® practitioners were randomly selected from a group of 50 health practitioners who responded to the invitation to participate in this study. None of them was aware of the nature of the study prior to the selection of the participants. Three out of the seven were randomly selected again as examiners and the other four were assigned to be the subjects. Four allergens (Soybean, MSG, Clorox and distilled water) were tested on these four subjects by each of the three examiners and repeated the testing on the same subjects using the same allergens two more times by the same examiner. The total number of tests performed was 48.

Results: Statistical analysis was performed to assess the precision and accuracy of inter and intra-examiner reliability, percentage of agreement and degree of confidence. Data was checked for normality. The assumptions were met for randomization and homogeneity of variance but did not meet the assumption for normal distribution using the number of participants in the study; but the criterion was satisfied when the total number of performances were used in the assessment. This study demonstrated significant inter-examiner reliability when tested by a group of examiners comprising both experienced and inexperienced NAET® practitioners. Significant agreement was observed upon evaluation of the Inter-examiner testing score by Kappa Coefficient; between E101 and E102 p-value was <.000; between 101 and 103 was <.001; between 102 and 103 was P-value <.001. The examiners were blinded to the allergens and repeatedly tested each item for three different times. Significant correlation was observed among the results of repeated tests by individual examiners on single allergen, showing that there was significant consistency in the reproducibility of the testing procedure. [first time testing (NST₁: 87.5% with a P-value of .001, and a Confidence Interval of 0.44-1.00; for second time testing (NST₂: 68.8% with a P-value of .05, and a Confidence Interval of -.05-0.80; and for the third time testing (NST₃: 68.8% and with a p-value of 0.02 and a Confidence Interval of -.07-0.7)].

Conclusions: This study supports the use of NST-NAET® as a reliable screening modality to detect various hyper-sensitivities.

INTRODUCTION

Nambudripad's Allergy Elimination Techniques (NAET®) utilize specific Neuromuscular Sensitivity Testing (NST) procedures to detect hypersensitivities to various substances from one's surroundings (Nambudripad, 2002, Leisman, 1998, Shima, 1992). Even though NST has been used extensively in NAET® practice, there have not been any published studies so far. Hopefully, this randomized, double-blinded study will allow for more research in this area.

Muscle Response Testing has been used by a variety of health practitioners including nutritionists, holistic medical practitioners, and kinesiologists for detecting the strength of muscles and associated weaknesses in order to assess various imbalances and energy disturbances in the body. Some of the sensitivities that have been detected include food sensitivities, nutritional deficiencies, neuro-emotional imbalances, musculoskeletal deficiencies, glandular deficiencies, and other dysfunctions (Daniels, Lucille, and Wothingham, Goodheart, 1964, Lawson, 1997, Valentine, 1997, Schmitt, Leisman, 1998, Shima, 1992, Herman, 2004, Ludtke, Kunz, Seeber, Ring, 2001). Even though many alternative and traditional disciplines utilize MRT for general screening, a literature search revealed that very few articles have published in the past related to MRT. There is insufficient evidence to support the efficacy of the reliability of this technique from the literature. Therefore, it is very natural to discredit any form of muscle testing as a modality for clinical diagnosis. One study claims MRT to be an unreliable source of screening for nutrient status (Kenney JJ, Clemens R, Forsythe KD., 1988).

Oriental medical doctors used a testing procedure called, *Medical I Ching* (Shima, 1992) as one of their diagnostic modalities for over 6,000 years. NST and MRT have originated from this *Oriental medical*

procedure -Medical I Ching. Neuromuscular Sensitivity Testing is based on the body's communication pathway to the brain (Goodheart 1964, Nambudripad 1999, Low 1983). Using NST, the patient can be tested for various sensitivities in a short period of time. In MRT, the tester (practitioner) compares the strength of a predetermined test muscle in the presence and absence of a suspected allergen (Goodheart 1964, Nambudripad 1999, Valentine, 1997). If the particular test muscle weakens in the presence of an item, it signifies that the item is an allergen. If the muscle remains strong, the substance is not an allergen.

Neuromuscular Sensitivity Testing (NST) is a modified form of muscle response testing technique that was developed in the U.S. by Dr. George Goodheart in 1960 (Goodheart 1964). NST is slightly different from MRT, especially in the initial steps of the procedure. One of the most important steps of NST is to prepare the subject's body for this testing modality through specific Oriental medical balancing procedures. This consists of two important steps:

- 1). The status of energy flow through the meridian system needs to be determined if it is overflowing or under flowing to receive accurate test results via NST.
- 2). The subject must be energetically, physically, physiologically, and emotionally balanced with the energy of the examiner before the tester begins to compare the strength of the test muscle.

If the subject is not energetically balanced, the subject can be balanced by using NAET® balancing procedures (Nambudripad, 1999). If the energy is overflowing, it is not advisable to perform any testing procedures on that particular day. Thus the main difference between MRT and NST is that in the latter, a lot of emphasis is given to the energetic and holistic state of the physical, physiological and emotional status of the patient before beginning the testing in addition

to determining how strong a muscle responds to an applied force in the presence or absence of an item.

STUDY DESIGN

This study used a sample of both experienced and inexperienced practitioners in a totally blinded and randomized testing environment. Seven NAET® practitioners were randomly selected from a group of 50 health practitioners who responded to the invitation to participate in a study. None of them was aware of the nature of the study prior to the completion of the study. Three out of the seven were randomly selected again as examiners and the other four were assigned to be the subjects. Four allergens (Soybean, MSG, Clorox and purified water) were tested on these four subjects by each of the three examiners and repeated the testing on the same subjects using the same allergens two more times by the same examiner. The total number of tests performed was 48.

SETTING

The study was conducted at the Pnib Research Center, in Buena Park, California in October 4th, 2002.

METHODOLOGY

Selection of Subjects: The study included four (4) subjects who volunteered to participate. The subjects were part of a refresher course for NAET® practitioners. They included two males and two females, ranging in age from 42 to 64. The subjects were all physicians with a mix ethnic backgrounds. The subjects had no known allergies (per conventional western medical guidelines). Two subjects had prior experience with NST and MRT. The other two had limited experience in NST.

Examiners: The study included three (3) NAET® examiners who volunteered to participate. The examiners were part of a refresher course for NAET® practitioners. The examiners included two females and one male, ranging in age from 48 to 55. The educational background of all the examiners included study in acupuncture and training in NAET. The group had a

mixed ethnic background. The examiners had practiced NST-NAET® for an average of six years.

Allergens: Four (4) glass test tubes filled with a small sample of allergens were used which were specifically prepared for the study. The allergens included Soybean, Clorox, MSG, and water. These allergens were selected because they represented a food item, a food additive, a household cleaning agent and water. The allergen tubes were prepared for the study using commercially available Soybean, Clorox, MSG, and purified water. Two sets of the four allergen tubes were prepared 24 hours prior to the study. All subjects received allergens from the same set. A second set of allergens was kept as a backup.

Randomization: The monitor assigned preassigned ID number labels to the examiners and subjects on a first come basis. The subjects were examined in a randomly determined order. The examiners were also made to initiate their examination in a randomly determined order. The sequence of allergen tubes given to the subjects was randomly determined. Random sequences for subjects, examiners, and allergens were determined by pulling numbers from a hat.

BLINDING PROTOCOL

The subjects, examiners and allergens were assigned a specific code to blind from each other. The monitor rotated the randomly assigned allergens to subjects. The subjects were blinded to the allergen they received. The examiners were blinded to the allergen being tested. The examiners were blinded to the other examiner's results. The examiner and subject did not discuss the result of the NST exam. The examiners and subjects did not communicate (verbally) at any stage of the research project.

MONITOR

In the examination room there were no one present other than the examiner and the subject. The monitor ushered the subjects, one at a time, into the examination

room. The monitor gave the subjects the allergen tubes, one at a time. The monitor ushered the examiners, one at a time, into the examination room. The monitor ensured that approximately 35 seconds elapsed between examiners entering the examination room. The 35 seconds should enable the examiner to conduct the NST (once, about 5 seconds) and allow for the subject to rest for 30 seconds between NSTs. The monitor ensured that the examiner left the examination room immediately following the completion of each set of NST and also ensured that the examiner went directly from the examination room to the recorder to convey the results of the NST. The monitor also ensured that the subject received about 30 seconds rest between the each examiners or each new set of NSTs (Total of three times for each examiner). The monitor entered the examination room between the second and third retesting of the same allergen, this was to maintain consistency with his/her appearance in the examination room to change the allergens. The monitor further ensured that the examiners had no verbal communication between themselves while they waited their turn to examine the subject.

RECORDER

The recorder recorded the results of each NST exam conducted by the examiner (see Table 2). The recorder ensured accuracy of recording appropriate

subject and allergen scores for each examiner. The recorder had the examiner indicate on a cue card whether the subject's NST is a PASS (strong NST = 0, no allergy) or FAIL (weak NST=1, allergic) for the specific NST exam. The recorder and examiner had no verbal communication.

TEST- RETEST PROTOCOL

Each examiner examined the same subject with the same allergen at three different times during the study.

NST PROCEDURE

General and specific details of neuromuscular sensitivity testing are covered (it is not possible to cover the entire procedure in this volume but will be presented in the future issues of this journal as continuing series) under the section titled *NAET® protocols and procedure* in this journal and available from other resources (Nambudripad, 1999, 2002, 2003). Some minimal and special aspects of NST procedure that applies to this particular study is provided below that may help the reader to understand this study.

FIND AN INDICATOR MUSCLE

The first step of NAET® is “finding an indicator

TABLE 1 – RANDOMIZED ORDERS USED IN NST-NAET®

No	Subjects	Examiners	Allergen	Testing
1	S503	E103	A7984 (MSG)	NST ₁
2	S504	E101	A3691 (Clorox)	NST ₂
3	S501	E102	A2142 (Soybean)	NST ₃
4	S502		A6248 (water)	

muscle.” One must locate a strong muscle in the body that is convenient to use without causing any pain or discomfort. The commonly used muscles are: deltoid, pectoralis major clavicular, and quadriceps femoris.

The patient should be in the supine position, one palm at his (her) side, the other arm raised 45-90 degrees to the body, palm facing outward, thumb pointing caudally towards the great toe on the same side (Lung-11 pointing towards Liver-1). This arm position is encouraged for the normal energy flow. The examiner always stands on the opposite side of the raised arm of the patient. The examiner applies gradual steady pressure (about 5-10 lbs of pressure approximately for 5 seconds) to the subject's raised forearm to push the arm caudally as the subject resists the pressure. The examiner feels for the strength of the resistance. The muscle that is capable of resisting the examiner's pressure is called an indicator muscle. If the subject is too strong, and the examiner is too weak in strength, the subject's arm can be positioned about 45 degrees above the leg (instead of 90 degrees to the body) to test. Pressure is applied against the forearm to push the forearm down caudally on the same side.

BALANCING THE SUBJECT

If the subject cannot resist the examiner's push on his/her arm, he/she is not energetically balanced. Before conducting the NST, the examiner should balance the energetic state of the subject. This can be achieved by utilizing the specific NAET® energy balancing technique (Nambudripad, 1999, 2002).

Then the status of the energy flow through meridians is checked by testing *overcharged meridian check* (Nambudripad, 1999, 2002; Low, 1983) to determine if the energy is overflowing. If the energy is found to be overflowing the subject needs to be energetically balanced again until the energy flow is normalized.

STATISTICAL ANALYSIS

Statistical analysis (Zar, 1999; Reddy, 2002; Dawson & Trapp, 2001) of the data was conducted by Prof. M.V. Reddy and K. P. Suresh at NIMHANS,

Bangalore, India. The statistical software SAS, SPSS 10.0 and Systat 8.0 were used for the analysis of the data and Microsoft Word and Excel have been used to generate graphs, tables etc. Normality assumptions were checked using SAS. The Chi square and Fisher Exact tests have been used to find the significance of proportions of various observations (between the different allergens, test, and testers (raters)). Jaccard coefficient of similarity has been used to find examiner's/rater's similarity in assessing the presence or absence of allergy.

The objective of the statistical analysis was to check whether there were any correlations between the results obtained by different examiners for a given allergen while performing NST on a given subject. From these correlation values the reliability of Neuromuscular Sensitivity Testing to detect allergen is established. In the correlation analysis, we tested each examiner's ability to test the same allergen repeatedly. Finally, the inter-reliability testing within the examiner group was also calculated.

RESULTS

Table 1 and the appendix summarize the various Neuromuscular Sensitivity Tests that have been performed on the subjects during this study. The analysis is performed almost similar to a very recent inter-examiner muscle testing reliability study (Monti DA, Sinnott J, et al, 1999, Schmitt WH Jr, Leisman G).

This study demonstrated significant inter-examiner reliability when used by a group of examiners comprising both experienced and inexperienced NAET® practitioners. Inter Examiner Agreement as per Kappa Coefficient between the examiners E101 and E102 was as follows: for the first time testing (NST₁): 100% with a P-value of 0.000, and a Confidence Interval of 0.61-1.00; for second time testing (NST₂): 87.5% with a P-value of .001, and a Confidence Interval of 0.43-1.00; and for the third time testing (NST₃): 62.5% and with a p-value of 0.275 and a Confidence Interval of 0.34-0.62.

Inter Examiner/Rater Agreement as per Kappa Coefficient between the examiners E101 and E103 was as follows: for the first time testing (NST₁): 87.5% with

Table 2 - Results from NST Reliability Experiment (0= no allergy and 1=allergy)

Subject: S502	Sample No.	Examiner ID	1st NST	2nd NST	3rd NST
Male	A 7984	E 103	0	0	0
54 years		E 101	0	0	1
Hispanic		E102	0	0	1
	A 3691	E 103	1	1	1
		E 101	1	1	1
		E102	1	0	1
	A2142	E 103	0	0	0
		E 101	0	0	0
		E102	0	0	1
	A6248	E 103	1	0	1
		E 101	1	1	1
		E102	1	1	1
Subject: S501	A 7984	E 103	0	0	0
Female		E 101	0	0	0
42 years		E102	0	0	1
Asian	A 3691	E 103	0	0	0
		E 101	0	0	0
		E102	0	0	0
	A2142	E 103	0	1	1
		E 101	1	1	1
		E102	1	1	1
	A6248	E 103	1	1	1
		E 101	1	1	1
		E102	1	1	1
Subject: S504	A 7984	E 103	1	0	1
Female		E 101	1	1	1
64 years		E102	1	1	1
White	A 3691	E 103	0	0	0
		E 101	0	0	1

Table 2 cont'd - Results from NST Reliability Experiment (0= no allergy 1=allergy)

Subject: S503	Sample No.	Examiner ID	1st NST	2nd NST	3rd NST
Male	A 7984	E 103	0	0	0
63 years		E 101	0	0	0
White		E102	0	0	0
	A 3691	E 103	1	1	1
		E 101	1	1	1
		E102	1	1	1
	A2142	E 103	0	0	0
		E 101	0	0	0
		E102	0	1	1
	A6248	E 103	1	1	1
		E 101	1	1	1
		E102	1	1	1

As shown in the Table 2, three examiners tested four allergens on four subjects and repeated the tests three times on the same allergens with one hour gap between the retests. The study was completely blinded. The examiners and subjects were kept totally blinded from each other and from the samples. Examiners, subjects and samples had pre-assigned numbers and monitor and recorder used these numbers for recording the data.

a P-value of .001, and a Confidence Interval of 0.44-1.00; for second time testing (NST₂): 81.3% with a P-value of .004, and a Confidence Interval of 0.27-0.98; and for the third time testing (NST₃): 68.8% and with a p-value of 0.045 and a Confidence Interval of -0.02-0.81.

Inter Examiner/Rater Agreement as per Kappa Coefficient between the examiners E102 and E103 was as follows: for the first time testing (NST₁): 87.5% with a P-value of .001, and a Confidence Interval of 0.44-1.00; for second time testing (NST₂): 68.8% with a P-value of .05, and a Confidence Interval of -.05-0.80; and for the third time testing (NST₃): 68.8% and with a p-value of 0.02 and a Confidence Interval of -.07-0.76.

DISCUSSION

In this study, our primary aim was to check whether there is any reliability and consistency between examiners and examiners themselves when repeated the test on the same item without being aware of the repeated testability via NST. Within the margin of errors the data obtained in this randomized blinded study completely support the NST-NAET® screening modality to screen allergies and hypersensitivities.

Table 3: Intra-class Correlation Co-efficient for Estimating Inter-Examiner/Rater Reliability.

Allergen	NST₁	NST₂	NST₃
A7984	1.00	0.40	0.33
A 3691	0.66	0.25	0.33
A 2142	0.40	0.63	0.00
A 6248	-	-0.09	-0.09
Overall	0.83	0.57	0.38

Table-3: Presents the results of the Intra Class Correlation Coefficients (ICCs) that are calculated to assess the reliability of testing the allergens while performing testing and retesting. Inter-examiner/rater reliability is computed from Intra Class Correlation Coefficient (ICC). Negative ICC is considered as poor reliability. Higher inter-examiner/rater reliability (overall value) is noted at NST₁ (first test) and the reliability coefficient decreases at NST₂ (second) and NST₃ (third) tests. Also, good inter-examiner/rater reliability for the allergen, A7984 and A3691 is noticed at the first trial (NST₁) compared to any other allergens.

Table 4: Inter Examiner Agreement as per Kappa coefficient

E101 vs. E102	NST₁	NST₂	NST₃
Kappa Coefficient (k)	1.00	0.75	0.14
P value	0.000	0.001	0.275
95%CI	0.61-1.00	0.43-1.00	0.34-0.62
Bias Adjusted Kappa	1.00	0.75	0.13
% of agreement	100.0	87.5	62.5
% of Distinguishability	100.0	98.0	50.0

The agreement of combinations of two examiners/raters is investigated by using the Kappa Coefficient of Agreement. In Table 4, the results are presented for a pair-wise comparison. The results clearly show that E101 & E102 have good agreement at NST₁ & NST₂. Similarly, the results in Table 5 show significant agreement between E101 & E103 at all instances of testing/examination. In Table 6, the results are presented for comparing E102 & 103. The Tables 4-6 must be compared and contrasted in order to help the isolation of the Examiner/Rater who has tested inconsistently.

Table 5: Inter Examiner Agreement as per Kappa Coefficient

E101 vs. E103	NST₁	NST₂	NST₃
Kappa Coefficient (k)	0.75	0.63	0.39
P value	0.001	0.004	0.045
95%CI	0.44-1.00	0.27-0.98	-0.02-0.81
Bias Adjusted Kappa	0.75	0.61	0.37
% of agreement	87.5	81.3	68.8
% of Distinguishability	100.0	100.0	86.7

Table 6: Inter Examiner Agreement as per Kappa Coefficient

E102 vs. E103	NST₁	NST₂	NST₃
Kappa Coefficient (k)	0.75	0.38	0.41
P value	0.001	0.053	0.021
95%CI	0.44-1.00	-0.05-0.80	-0.07-0.76
Bias Adjusted Kappa	0.75	0.35	0.35
% of agreement	87.5	68.8	68.8
% of Distinguishability	100.0	85.7	100.00

Distinguishability, in terms of percentage, of the two categories (Non-allergic (0), Allergic (1)) is 100%, if there are no disagreements between examiners and decreases as the proportion of disagreements increases. It becomes 0 if the disagreement equal or outnumber the agreement. Agreement (in percentage) is the Percentage of Agreement (0-0 & 1-1) between the two examiners. Kappa Coefficient (k) is a coefficient of agreement between the two examiners varies between - 1 to +1

$k \leq 0$	Poor agreement
0.0 to 0.20	Slight Agreement
0.20 to 0.40	Fair Agreement
0.40 to 0.60	Moderate Agreement
0.60 to 0.80	Substantial Agreement
0.80 to 1.00	Almost Perfect Agreement

Overall, the examiner E102 has little deviation in testing compared to E101 & E103. Most probably this may be due to less internal consistency (0.57) for E102.

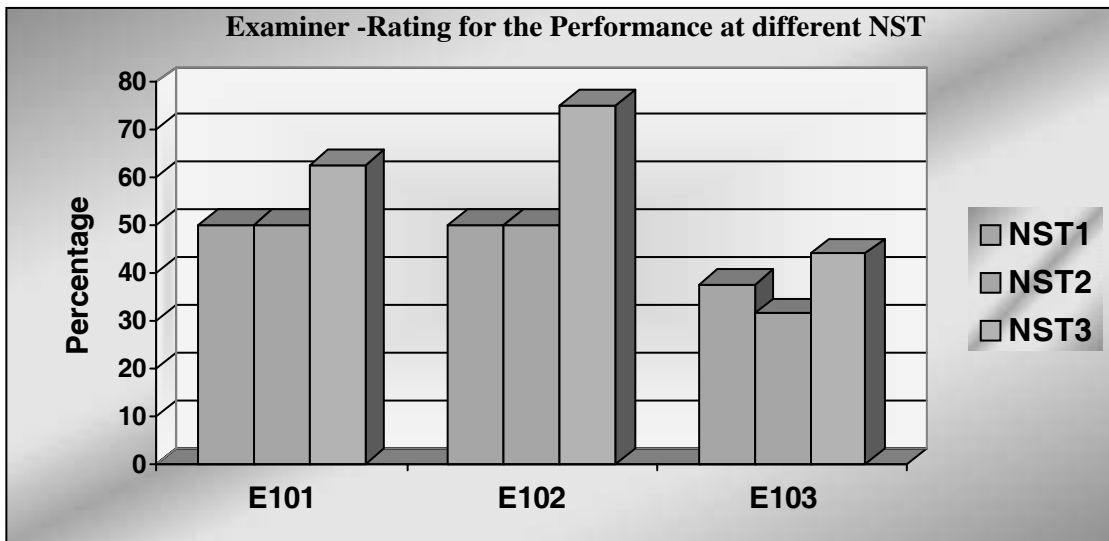
Table 7: presents the results (in numbers and percentage) of the allergy testing (scoring the ability to detect allergies and sensitivities for positive diagnosis of allergy) for the three different examiners/raters during the three test performances. Once again, the examiner E102 has little deviation in testing compared to E101 & E103.

TABLE - 7: EXAMINER RATING FOR THE ALLERGY AT DIFFERENT NSTS

N=16	E101	E102	E103
	No (%)	No (%)	No (%)
DIAGNOSING AS ALLERGY (1)			
NST ₁	8 (50.0)	8 (50.0)	6 (37.5)
NST ₂	8 (62.5)	12 (75.0)	7 (43.8)
NST ₃	10 (62.5)	12 (75)	7 (43.8)

Examiner -Rating for the Performance at different NST

	E101	E102	E103
NST ₁	50	50	37.5
NST ₂	50	50	31.3
NST ₃	62.5	75	43.8



COMMENTS

It is recommended that similar studies should be done on larger samples of subjects to determine the efficacy of NST in screening food sensitivities. It is also suggested that similar studies should be done using large number of examiners to determine the inter-examiner reliability of NST testing. Hopefully, this randomized, double-blinded study will encourage for more research in this area.

ACKNOWLEDGEMENTS

We sincerely want to express our profound gratitude to Prof. M.V. Reddy and K. P. Suresh at NIHANS, Bangalore, India. We also thank our NAET Research associates, volunteers (examiners, monitor, recorder and subjects) who participated in this study.

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APPENDIX

SEQUENCE OF MUSCLE TESTING

A. FIRST ALLERGEN

I. First subject (S503) – Baseline and Balancing

The monitor will usher the first randomly ordered subject (S503) into the examination room.

The monitor will usher the three examiners, one at a time in 35 seconds intervals and based on a randomly ordered sequence (i.e., E103, E101, E102), into the examination room to conduct the Baseline NST and check the energy balance.

The baseline NST reading will not be scored.

First subject (S503), First Allergen (A7984), First NST

The monitor will give the first subject (S503) the first randomly ordered allergen capsule (A7984) and ensure that neither the capsule nor the code on the capsule is visible.

The monitor will usher the three examiners, one at a time in 35 seconds intervals and based on the randomly ordered sequence (i.e, E103, E101, E102), into the examination room to conduct the First NST for the first allergen.

In the rest of the steps that are listed below (A –C), the above procedure is repeated with the appropriate randomly chosen subjects while they hold the respective sample in a random fashion. The individual steps are identical with the above cases and is not repeated here for brevity.

Second subject (S504) – Baseline and Balancing

Second subject (S504), First allergen (A7984), First NST

Third subject (S501) – Baseline and Balancing

Third subject (S501), First allergen (A7984), First NST

Fourth subject (S502) – Baseline and Balancing

Fourth subject (S502), First allergen (A7984), First NST

Fourth subject (S502), First Allergen (A7894),
Second NST

B. FIRST ALLERGEN: SECOND NST

1. First subject (S503), First allergen (A7894), Sec-
ond NST

Second subject (S504), First Allergen (A7894),
Second NST

Third subject (S501), First Allergen (A7894), Sec-
ond NST

C. FIRST ALLERGEN: THIRD NST

First subject (S503), First Allergen (A7894), Third
NST

Second subject (S504), First Allergen (A7894),
Third NST

Third subject (S501), First Allergen (A7894), Third
NST

Fourth subject (S502), First Allergen (A7894),
Third NST