CHAPTER 4: RESEARCH METHODOLOGY

The investigation is made up of four sections, which moves sequentially from a broader perspective, to a more focused approach of the phenomenology and possible significance of leg-shaking behavior.

An overview of the sections is as follows:

Section 1: Exploratory naturalistic observation
Survey: Sample selection

Section 2: A study of certain personality traits and attention characteristics among leg shakers and non leg-shakers

Section 3: Pedigree analysis

Section 4: Cortisol studies.

SUMMARY OF STUDY FORMAT

<table>
<thead>
<tr>
<th>Section 4.1: Exploratory naturalistic observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=22265</td>
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<tr>
<td>Objective: To study the incidence of leg-shaking in different settings</td>
</tr>
<tr>
<td>Methodology: Naturalistic observations</td>
</tr>
</tbody>
</table>

Survey for sample selection to identify a matched group.

<table>
<thead>
<tr>
<th>N=3013</th>
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<tbody>
<tr>
<td>Objective: To select a matched sample of participants for further studies</td>
</tr>
<tr>
<td>Assessment Tool: A 28 item Leg-shaking screening questionnaire</td>
</tr>
</tbody>
</table>
### Section 4.2: Personality traits and attentional features

**N**: 348

**Objective**: To study Personality and cognitive differences between leg-shakers and non leg-shakers

**Design**: A two group matched design

**Assessment tools**: Neuroticism, Extroversion, Openness Personality Inventory Revised (NEOPI-R), The Padua Inventory (PI), The Stroop Task, The Paced Auditory Serial Addition Task (PASAT)

### Section 4.3: Pedigree Study

**N**: 139 Family studies

**Objective**: To study the inheritance patterns of leg-shaking behaviour

**Design**: Gene Pedigree analysis

### Section 4.4: Cortisol Studies

**N**: 20

**Objective**: To study the salivary cortisol levels in leg-shakers and non leg-shakers

**Design**: A two group matched design

**Assessment tool**: Elisa kit for salivary cortisol analysis

This chapter presents the information about the sample, assessment tools, research design, methodology, hypothesis and data analysis of the four sections.
4.1 **Exploratory Naturalistic Observation.**

The behavior observed was leg-shaking. This is a stereotyped behavior. A stereotypy is defined as an involuntary or unvoluntary coordinated, patterned, repetitive, rhythmic and purposeless but, seemingly purposeful or ritualistic movement.

From an operational point of view, leg-shaking is a rhythmic stereotyped, involuntary, unvoluntary, repetitive movement. This behavior is quite operationally defined by listing the different actions of the movement involved thereby, attaching a degree of precision and reliability. Leg-shaking has the simplicity of a response indicator. Involuntary movements are unplanned, unwilled and non-suppressible. Unvoluntary movements occur in response to, or are driven by somatic sensations or unwanted urges, anxiety and compulsions. They begin as unwilled and are suppressible.

Using a molar approach, the larger whole behaviour was split into its smaller segments in units of leg shaking. Eleven specific types of leg-shaking behavior were listed which included the total universe of leg-shaking behavior.

The following are general descriptive definitions of leg-shaking movements: *(refer to Appendix B for line figures)*

1. *Movements in a sagittal plane about a frontal axis. These are best observed from the side.*

   a: Flexion in which the angle between the surfaces of two adjacent segments decreases as the joint is bent.
b: Extension, in which the angle between the segments increases. It is the opposite movement to flexion.
c: Dorsiflexion, where the leg is pulled up towards the leg.
d: Plantar flexion in which the foot moves downward from the leg.

II. Movements in a frontal plane about a sagittal axis. These movements are best observed either standing in front or behind the person moving.
a: Abduction in which the segment moves away from the middle of the body.
b: Adduction in which the segment moves towards the midline of the body. A special case is movements of the digits. In the foot, the midline is taken as the second digit; in the hand it is the third digit. Abduction and adduction of the thumb takes place in the sagittal plane.
The nerves and muscles involved in the leg shakes described below are given in Appendix C.

Using the above classification and description eleven leg-shaking movements was possible. They were as follows:

4.1.1 TYPES OF LEG-SHAKES.

a) Sitting position:

1 Only feet/foot.
2. Leg up to knee.

3. The whole leg, like bellowing.

4. Thigh crossed with foot rotation

5. Thigh crossed, leg up to knee, up down movement

6. Thigh crossed, only foot shaking

7. Feet crossed, like bellowing

b) Lying posture

8. Feet crossed rubbing each other in a lying or relaxed position.

9. Feet crossed and swaying movement
c). **Standing posture**

10. Shaking one leg with heel anchored

11. Shaking one leg with toes anchored.

In this investigation the investigator was a covert naturalistic observer. Individuals in groups who were observed for leg-shaking were unaware of being watched. The investigator was unobtrusive and there was no attempt to control or change any behavior. The observer was not noticeable and the observed behavior was not given any prominence that it was an object of interest or concern. In all settings a rough map of the seating topography was sketched. (Refer to specimen maps in Appendix D.)

The objective of the coverage involved the breadth and depth of observation. The usual, real life settings were chosen for observing the phenomena of leg shaking. These situations/settings were all public domains. The settings were classrooms, examination, canteen, churches, libraries, parks, foyers, airports, restaurants, J.J Hospital psychiatric clinic and railway compartments. With reference to the settings (situation sampling), and the persons observed (people sampling) was kept in focus (Webb, et al, 1981).
As this was a non-experimental naturalistic behavioral observation the number of individuals/group observed were selected only on the criteria that they happened to be a part of the setting that was being observed. Hence, the setting was selected and the people who were part of that setting became the group to be observed.

The following settings/situations were observed (see Appendix D. for topographical sketches for all settings)

4.1.2 Situation 1: Classrooms

Boys, girls and mixed groups, from grades 1-10, higher secondary, undergraduate and postgraduate classes were observed in their classrooms. In these settings the researcher sat in an unobtrusive manner at a strategic point where she could observe a set of students. She sat and pretended to be busy with writing. A class map with the seating arrangement was drawn. The gender and leg-shaking was identified. The minimum time of observation was 40 minutes in this setting.

4.1.3 Situation 2: Examinations

Boys and girls from grade one to post graduation were observed during examinations. The examination time ranged from an hour to a three-hour paper. The observer, in all cases sat in an unobtrusive manner, at a strategic point and sometimes assisted in the supervision. A class map with the seating arrangement was drawn. The gender (whether male or female student), and leg-shaking was identified. A
further detailed observation was made of this setting. Thirty-five three-hour examination groups were observed for the entire three hours. The time frame was divided into three parts.

i) \( T=1 \). First half an hour of the first hour.

ii) \( T=2 \). First half an hour of the second hour.

iii) \( T=3 \). The last half an hour of the third hour.

Three maps were drawn for the three time frames. These three time frames were chosen on the basis of pilot observations done earlier. A detailed time frame analysis was made and the time zones chosen. (Refer 4.6 Pilot study)

4.1.4 Situation 4: Libraries

School and college library reading halls were chosen for observation. A total number of 799 students were observed for approximately 40 minutes. A map with the seating arrangement was drawn to record the number of leg-shakers in the observed group which ranged from approximately 15 to 35 students at any given point of time.

4.1.5 Situation 3: a) Canteens b) Restaurants.

School and college canteens were chosen as settings for naturalistic observations. The observer chose a strategic spot where a large number of students could be observed. A topological sketch was drawn. The gender and leg-shakers. were identified on the map. A total number of 545 diners in 24 restaurants were observed. The
observations were made for three to four tables at which approximately 4 to 6 number of individuals were seated. A similar procedure for notification used in other maps was also observed. The minimum time of observation was 45 minutes.

4.1.6 Situation 4: Waiting places.

Hospital foyers, Doctors waiting rooms and waiting places at airports [when flights were delayed] were chosen as settings.

In all these waiting areas, the observer marked an area that included a number of people that could be comfortably observed. The approximate time for observation ranged from 30 minutes to one hour. The gender and number of leg-shakers was noted down on the map drawn.

4.1.7 Situation 5: Churches and chapels

A total of 701 churchgoers in 31 churches and chapels were observed when the religious ceremony was in progress. The observer silently sat on the last row and observed a convenient group of people. When necessary the investigator changed her place to get a better view of rows on the opposite aisle side. The time of observation was approximately forty-five minutes. The gender and number of leg-shakers was noted down on the map drawn.
4.1.8 Situation 6: Gardens and parks

Groups of people in 13 gardens and parks were observed who were seated on benches. The observer would stroll up and down slowly noting the number of people shaking their legs, on the map. The minimum time of observation was 30 minutes.

4.1.9 Situation 7: Long distance travel in trains

Approximately 400 people were observed while they were traveling long distance by trains. Groups observed here comprised of five to ten people each. They were seated in the vicinity of the observer. Observations were made for time periods ranging from half an hour to one and a half hour. The leg-shaking was noted down on the data map.

4.1.10 Situation 8: Never treated-first episode OPD patients.

First episode, never treated patients (i.e. never received any anti psychotic/neuroleptic medication. They also known as 'neuroleptically-naïve') were diagnosed by the psychiatrist on duty at the psychiatric OPD of the JJ group of hospitals. It was the patient's first visit to a psychiatrist. Their physician, or another OPD of the same hospital referred them. The criteria of choosing a patient for observation was that it had to be their First Episode of Psychosis (FEP) and did not take any medication earlier. Since it was the patients first appointment the psychiatrist spent approximately 20-30 minutes. The patients sat on the side stool in full view for the psychiatrist to be
investigated and to prepare a brief case history and give the diagnosis of schizophreniform. One or more relatives accompanied all patients. During this first session the psychiatrist also observed and noted the leg-shaking behavior of the patient. The researcher was seated in the foyer just outside the doctor’s chamber and could also observe the leg-shaking behaviors of all patients that entered the room.

4.1.11 Situation 9: Visually impaired groups:

The visually impaired individuals from the four major institutions of Mumbai (refer to the list in appendix E) were observed in the following settings: a) Classrooms, b) Examinations, c) Workshops d) Canteens and recreation rooms. An identical methodology like that was used for setting number 4.1.2,4.1.3 and 4.1.4 was followed for this group.
Table 3: Naturalistic observation of individuals in different settings

<table>
<thead>
<tr>
<th>Settings</th>
<th>M-S</th>
<th>F-S</th>
<th>M-VI</th>
<th>F-VI</th>
<th>Mixed</th>
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<tr>
<td>Class-Grade 1-4</td>
<td>216</td>
<td>325</td>
<td>71</td>
<td>253</td>
<td></td>
</tr>
<tr>
<td>Grade 5-8</td>
<td>847</td>
<td>437</td>
<td>71</td>
<td>274</td>
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<tr>
<td>Grade 9-10</td>
<td>213</td>
<td>207</td>
<td>200</td>
<td>50</td>
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<tr>
<td>College</td>
<td>292</td>
<td>765</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exam-Grade 1-4</td>
<td>222</td>
<td>321</td>
<td>414</td>
<td>273</td>
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</tr>
<tr>
<td>Grade 5-8</td>
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<td>400</td>
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<tr>
<td>Grade 9-10</td>
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<td>203</td>
<td>300</td>
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<tr>
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<td>954</td>
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<td>Grade 9-10</td>
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</tr>
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<td>Restaurant</td>
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</tr>
<tr>
<td>Library</td>
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<td>799</td>
</tr>
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<td>Church</td>
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<td></td>
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<td>701</td>
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<tr>
<td>Train</td>
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</tr>
<tr>
<td>Park</td>
<td></td>
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<td></td>
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<td>303</td>
</tr>
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<td>Foyer</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>402</td>
</tr>
<tr>
<td>OPD</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22265</td>
</tr>
</tbody>
</table>

M-Males, F-females, S-sighted, VI-visually impaired, OPD-outpatient department

4.1.12 Hypothesis:

Hypothesis 1: There will be no significant differences in leg-shaking behaviour between the visually impaired (VI) and the sighted (S) groups.

Stereotyped behavior is observed in children and adults both with and without clinical disorders. The following assumptions explore possible differences between the sighted and the visually impaired samples and to explore the effect of age and situation variables if any.
Hypothesis 1.1: There will be no significant difference in the three settings (Classroom, examinations and canteen) for both the VI and S groups.

Hypothesis 1.2: There will be no significant difference age wise within the 3 settings (classroom, examination, and canteen) for both the VI and the S groups.

Hypothesis 2: There will be no significant differences in leg-shaking (LS) behavior among males and females.

Motor stereotypies and specific repetitive nervous habits have been examined in typically developing children. Gender distribution for stereotypies like nail biting, thumb-sucking, hair-twisting, finger twirling and body rocking has shown inconsistent results in several studies. The following predictions explore gender differences if any in leg-shaking behavior if any.

Hypothesis 2.1: There will be no significant gender differences in LS behaviour among the VI males and females.

Hypothesis 2.2: There will be no significant gender differences in LS behaviour among the S males and females.
Hypothesis 3: The incidence of leg-shaking behavior will not be significantly different in all the settings.

The contextual variables, which appear to be related to stereotyped behaviors, are novel environments, frustrating situations, restriction of movement, unnecessary waiting periods and conditions of fatigue and boredom. This hypothesis explores the incidence of leg-shaking in nine different settings.

Hypothesis 4: Significant hourly differences in the incidence of leg-shaking behaviour will not be observed in the three-hour examination setting.

This assumption explores specific environmental settings. Contextual and environmental aspects have been known to elicit stereotyped behaviors; "alert" vs "nonalert" states have been potent elicitors of rhythmic movements.

4.1.13 Data Analysis

1. Total number of individuals observed in the various settings and the number of leg-shakers.
2. The percentage of leg-shakers for each setting gender wise was calculated.
3. The detailed hourly study of the three-hour examination setting
4. Chi Square analysis for significant differences between various groups.

4.2 Exploratory Survey

The only objective for this survey was to gather information from a cross-section of students and to screen and locate participants for the 3 sections (4.3, 4.4, and 4.5) that follow in this investigation.

4.2.1 Sampling:

A cross-sectional survey design was used to identify the sample of leg-shakers. From a cross-section of 96 colleges, 13 undergraduate colleges (Arts, Science and Commerce) were selected from Mumbai city and suburbs (refer to the list in Appendix E.). In each of the colleges the foundation course and the applied component classes were chosen as they represent a heterogeneous combination of subjects. Every second boy and every third girl from the attendance register was picked randomly to be a part of the group. In this manner a total of 3013 participants in the age group of 17-25 were selected for the survey.
4.2.2 Assessment tool:

The Screening for the leg-shaking questionnaire is made up of 40 items. While preparing this scale 3 experts in Psychology and a Movement disorders specialist was consulted. They evaluated the scale as having adequate face and content validity. The experts suggested the suitability of the items for its intended use and reformulated some to
appear relevant and plausible. Thus all items were analyzed for qualitative content and quantitatively for their statistical properties. The questionnaire is placed in Appendix F.

Eighteen items were designed to identify the behavior and degree of leg shaking. These items covered all aspects of leg-shaking. A response format of a 5 point response scale ranging from “0”(not at all) to “4”(very much) measuring the degree of leg-shaking was used. An Item analysis to determine the discrimination index i.e. discrimination between shaker and non leg-shaker was calculated for the 18 items on 20 participants (Refer Appendix H.) The Alpha Coefficient for the 18 items was 0.89 and a test retest reliability calculated for a group of 30 students with an intervening period of six weeks was \( r_{tt} \): 0.93.

Item 8, 11 and 14 were adapted from the Fidgeting Tendency Questionnaire devised by Mehrabian and Friedman (1980). They were converted from their original 9-point scale to a 5-point scale and tested for a normal distribution. (Murphy & Davidshofer, 1998) The Alpha coefficient for these 3 items was 0.90.

Item number 33 to 41 were reproduced from the Hillside Akathisia Scale Version 4 (Flashbacker, et al, 1989) These items were criteria for screening of Restless Leg Syndrome (RLS) and were used as exclusion criteria.

Item 27 to 33 were also used as exclusion criteria.
4.2.3 Administration

During the first contact with the participants, the screening for leg shaking questionnaire was preceded by an orientation (one hour), for clarification and demonstration of the different types of leg-shaking. The respondents were given the questionnaires to take home in order to do self-observation for 2 to 4 days to report on their leg-shaking. This procedure was adopted to control the false negative reporting (i.e. responding as a non leg-shaker when the individual is actually a leg-shaker). The investigator took height and weight measures for calculating the ponderal index. The questionnaire had to be returned within 4 to 5 days. They were assured of the confidentiality of the data they provided the researcher. They were also informed that they may be selected for the final study and would be contacted personally. They were, however, told that they are free not to participate in the final study. Those willing to participate in the study were requested to fill the consent form. Refer Appendix G.

The goal of this survey was to select leg-shakers and matched non leg-shakers for this investigation.

4.2.4 Procedure used for sample selection

A total number of 3013 (1504 males and 1509 females) were given the questionnaire, of which 2713 (1294 males and 1419 females) returned the completed questionnaire. Using the exclusion criteria (items 27 to 33 of the leg-shaking screening questionnaire) 421 participants were eliminated
The remaining 2292 questionnaires were scored and 694 were identified as leg-shakers and 1598 were non leg-shakers.

Of the 1598 nonshakers (708 males and 890 females) every eight person from a list (ordered alphabetically) was randomly selected to form the non leg-shakers group. This resulted in a total of 187 (89 males and 98 females)

Of the 694 leg shakers a group of 190 (95 males and 95 females) shakers were chosen so as to get a normal distribution of the leg shaking scores.

These two groups were then further matched for age and grade and gender, thus obtaining a final sample of 348 (174 leg-shakers = 87 males and 87 females and 174 non leg-shakers = 87 males and 87 females)

4.3 Study of certain possible personality and attentional characteristics among Leg shakers and non-leg shakers

4.3.1 Sample

The sample comprised of two groups mainly, the Leg-shakers group (LS) and the comparison group of Non Leg-shakers group (NLS). The two groups were made equivalent for the most likely confounds so as to guarantee as few differences as possible in between the groups.

The two groups were matched for age, gender, years of education, (years after class 10), subject specialization (humanities, science & commerce) and family income.
Table 5: The mean, SD, df, t-values and significance between LS and NLS on Age, PR and education

<table>
<thead>
<tr>
<th>Variable</th>
<th>LS (n=174)</th>
<th>NLS (n=174)</th>
<th>df</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>20.58</td>
<td>20.42</td>
<td>0.05, ns</td>
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</tr>
<tr>
<td>SD</td>
<td>2.32</td>
<td>2.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ponderal ratio</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>14.00</td>
<td>15.21</td>
<td>1.02, ns</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>4.74</td>
<td>5.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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</tr>
<tr>
<td>Education</td>
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</tr>
<tr>
<td>Mean</td>
<td>4.64</td>
<td>4.63</td>
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<tr>
<td>SD</td>
<td>1.37</td>
<td>1.37</td>
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</tr>
</tbody>
</table>

p. >0.01
LS=leg-shakers, NLS=non leg-shakers.

4.3.2 Assessment Tools

The Neuroticism, Extroversion, Openness-Personality Inventory-Revised (NEO-PI-R) was first published by Costa and McCrae in 1985 and later revised in 1992. The NEOPI-R operationalizes the Five Factor Model (FFM) of personality. It consists of 240 items on a 5-point Likert scale anchored by "strongly agree" to "strongly disagree". The 5 factors (NEOAC), Neuroticism(N), Extroversion(E), Openness(O),
Agreeableness(A) and Conscientiousness(C) each of which consists of six facets or sub scales. There are 48 items for each factor and 8 items for each facet.

The construction of the NEO PI-R began with a consideration of the higher order factors as drawn from literature and then “items that, if answered in the key direction would suggest the presence of the underlying traits” (Costa & McCrae, 1992, p41).

The actual items are selected from the original pool through factor analysis identifying items that co vary with each other but, are relatively independent of other item clusters. Thus domains are identified, and within these domains the factors emerge from further factor analysis (Costa & McCrae, 1992).

The NEO-PI-R includes three items at the end of the test, asking respondents to indicate whether he or she has answered honestly, accurately, and responded to all items, and marked the response in the correct spaces on the answer sheet. To counter possible confounds, the direction of item keying is balanced. The instructions in the manual for detecting random responding involves spot checking for obvious response patterns and noting the number of consecutive items with identical responses (Costa & McCrae, 1992).

Internal consistencies obtained for the domains are good (Costa & McCrae, 1992). With coefficient alphas ranging from 0.86 (Agreeableness) to 0.92 (Neuroticism). Internal consistencies for facets are less strong, with coefficient alphas ranging from 0.56 (tender mindedness) to 0.81 (depression).
Convergent validity ranges from moderate to good.

The NEO-PI-R is a measure of normal personality traits that has demonstrated its utility in both clinical and research settings

### 4.3.3 Description of Domains and Facets.

**Neuroticism (N)** is a general tendency to experience negative affect such as fear, sadness, anger, embarrassment, guilt, and disgust.

**Anxiety (N1)** is an apprehensive, fearful, worrisome, nervous, tense and jittery state.

**Angry hostility (N2)** is a tendency to experience anger, frustration and bitterness

**Depression (N3)** is proneness to feelings of guilt, sadness, hopelessness, loneliness and dejection.

**Self-consciousness (N4)** is an emotion of shame and embarrassment, with high sensitivity to ridicule and proneness to feelings of inferiority and shyness.

**Impulsiveness (N5)** is the inability to control cravings, urges and desires. **Vulnerability (N6)** is the inability to cope with stress becoming dependent, hopeless and panicky.

**Extroversion (E)** is being assertive active, talkative, cheerful, up beat, energetic and optimistic.

**Warmth (E1)** is affection, friendliness and is most relevant to intimacy

**Gregariousness (E2)** is the preference of other people's company

**Assertiveness (E3)** is being dominant, forceful and socially ascendant
Activity (E4) is having a rapid tempo, a vigorousness of movement, a sense of energy and a need to keep busy.

Excitement seeking (E5) is a craving for stimulation and sensation seeking

Positive emotions (E6) are a feature of cheerfulness, optimism, exuberance and high spiritedness

Openness (O) is a curiosity about both inner and outer worlds, a willingness to entertain novel ideas, unconventional values and divergent thinking.

Fantasy (O1) is vivid imagination

Aesthetics (O2) is a deep appreciation for art and beauty.

Feelings (O3) are receptivity to one's inner emotions and intense feelings

Actions (O4) are an active willingness to try different activities and seek novelty

Ideas (O5) is intellectual curiosity and unconventionality

Values (O6) are the readiness to reexamine social, apolitical and religious values

Agreeableness (A) is a dimension of interpersonal altruism, sympathy and helpfulness

Trust (A1) is a disposition to believe that others are honest and well intentioned

Straightforwardness (A2) is being frank, sincere and ingenuous

Altruism (A3) is an active concern for the others welfare, as shown in generosity, consideration and a willingness to assist
Compliance (A4) is deference to others, an inhibition of aggression and an ability to forgive and forget

Modesty (A5) is humility and self effacement

Tender mindedness (A6) measures sympathy and concern for others

Conscientiousness (C) deals with the control of impulses, management of desires and the resistance to temptation

Competence (C1) is a sense that one is capable, sensible, prudent and effective. It is linked to an internal locus of control and self esteem

Order (C2) is being neat tidy and well organized

Dutifulness (C3) is a strict adherence to ethical principles and moral obligation

Achievement striving (C4) is having high aspirations, diligence, purposefulness and a strong sense of direction.

Self-discipline (C5) is the ability to begin tasks and carry them through completion despite boredom and distraction

Deliberation (C6) is thinking carefully before acting.

Psychometric features:

The NEO-PI-R Facet scales are also conceptually related to DSM-III personality disorders. Extensive work has been done on the validation and factor analytic structure of the scale and has given impressive quantifier markers.

Internal consistency and test retest reliability are the most commonly used indices of the reliability of tests and measures. To calculate the
alpha coefficient the SPSS 10.0 software version was used. Refer Table 8 in the pilot study (4.10)

4.3.4 The Padua Inventory.

The Padua inventory (PI) was developed by E. Sanavio in 1988. It is a sixty item self report inventory, which measures the degree of disturbance caused by a range of specified thoughts, behaviors and urges in normal and clinical groups. It uses a five-point scale. The PI is the only self-report scale, which includes strong obsessive dimensions as distinct from compulsions (Sanavio, 1988; Sternberger & Burns, 1990). It also appears to be one of the most widely used self-report measures of OCD in research and clinical activities.

Obsessions = Factor 1 + Factor 4
Compulsions = Factor 2 + Factor 3
Total PI score = Factor 1 + Factor 2 + Factor 3 + Factor 4.

Four factors or sub scales assessing; (a) impaired control over mental activities i.e. obsessions, intrusive thoughts and doubts (b) becoming contaminated i.e. assessing washing and cleaning compulsions and avoidance behavior associated with contamination fears (c) checking behaviors i.e. checking doors windows taps and light switches (d) urges and worries about loss of control over motor behavior i.e. impulse to break things, jump from high places, drive the car into someone and steal. The first and the last scales assess
obsessional symptoms while the other two scales assess compulsive phenomena. The scale was originally developed using an Italian sample. The authors identified four factors and reported high consistency for the total PI and its sub scales (Cronbach’s alpha coefficient > 0.80).

Culture and ethnicity influences the expression and course of symptoms in OCD (Thomas, et al, 2000). The test is widely used as a self-report measure. It is also extensively used with college samples to identify nonclinical OCD participants for research purposes. The Cronbach’s alpha coefficients and test-retest reliability coefficients were calculated for the PI total scale and for the subscales, see Table 6 in the Pilot study. (4.10)

Several countries have provided support for the reliability and factor structure of the PI. Italy (Sanavio, 1988), Dutch (Van Oppen, 1992; Van Oppen, Hoekstra, & Emmelkamp, 1993.), North America (Sternberger & Burns, 1990), Australia (Haffner, 1988; Haffner & Miller, 1990), Korea (Min, 1999), Britain (Mac Donald & D’Silva, 1999), and Spain (Chappa, 1998; Ibanez, Olmendo, Penat & Gonzalez, 2002; Mataix-Cols & Sanchez, 2000 Mataix-Cols, 2002) and Iran (Goodarzi & Firoozabadi, 2005).

4.3.5 Paced Auditory Serial Addition Task- (PASAT)

This task is a serial addition task used to assess capacity and rate of information processing, as well as sustained and divided attention. Gronwall in 1977 devised the original test. It is a prerecorded tape that
delivers a random series of 61 numbers from 1 to 9. The test provides an estimate of the participant’s rate of information processing i.e. the amount of information that can be handled at one time. The participant has to comprehend the verbal input, respond verbally and inhibit encoding his response while attending to the next stimulus in a series.

It is a measure of frontal lobe functioning and is believed to assess aspects of attention particularly information deficits, that are not tapped by other tasks (Spreen & Strauss, 1998).

Administration of the PASAT is by audiotape. The tape delivers a random series of 61 numbers from 1 to 9, delivered at the rate of every two seconds. The participant has to add pairs of numbers, ignore the answer given earlier and then add the next number to the previous number heard (not the answer just given), for e.g. in a list of numbers 5 7 3 4 and 2, the correct answer would be 12 (5+7), 10 (7+3) then 7 (3+4) and 6 (4+2). In taking the PASAT, individuals must be able to comprehend the auditory input, respond verbally, inhibit encoding of one’s own response to the previous item, all while attending to the next stimulus that is arriving in an externally pre-determined pace. Scoring is based on the number of items correctly answered out of the total sixty items presented. Higher scores indicate a better performance, capacity and rate of information processing as well as sustained and divided attention.

A high internal consistency with a split half reliability of approximately 0.90 has been reported for PASAT (Egan, 1988;
Johnson, Roethig, Johnson & Middleton, 1988). Test retest reliabilities are reported to be greater than $r_{tt}$: 0.90 (McCaffrey, 1995).

Spreen and Strauss, 1998 reported adequate construct validity for PASAT, which has been positively correlated with numerous measures assessing attention and speed of processing.

### 4.3.6 Stroop task

The purpose of the Stroop task (Stroop, 1935) is to measure an individual's ability to suppress a habitual response in favor of an unusual response. In order to accomplish this, the individual must be able to shift his or her perceptual set to adapt to changing demands (Spreen & Strauss, 1998).

The Stroop is based on findings that, 1) It takes longer to name colours than to read words, and 2) The longest time is needed to name colours when the word is printed in different colours of ink (e.g. correct response to the word "Red" printed in blue ink is "Blue") (Lezak, 1995).

This slowed time taken for naming response (interference score) when a coloured word is printed in different coloured ink has been interpreted as a measure of behavioral inhibition (Barkley, 1997).

Barkley defined behavioral inhibition as a) Withholding a response when immediate reinforcement for a response is available, b) Stopping an ongoing response to permit a delay and, c) Protection of a response delay from competing events. He has described the Stroop task as an instrument that places sources of behavioral control in
competition with each other. The stated results that follow can be interpreted as the abilities of interference control and persistence. These features are thought to be functionally related to frontal brain processes as persons with frontal lobe damage perform poorly on the interference portion of the task (Lezak, 1995; Spreen & Strauss, 1998).

Lezak (1995) reports satisfactory reliabilities for stroop task. Test retest reliability coefficient within one-month interval was $r_{tt} 0.91$. There are significant practice effects, which are interpreted as an active learning process that suppresses distraction (Reisberg, et al, 1980). Fortunately, since the current study does not utilize retest procedure; the practice effects are not relevant to the research.

The test measures the ease with which a person can shift his or her perceptual set to conform to changing demands and suppress a habitual response to a favored unusual one. There are a number of versions of the stroop task. This measure of selective attention and cognitive flexibility was originally developed by J. Stroop in 1935. The decrease in colour naming speed is called the 'colour-word interference effect'. The number of errors and time taken to complete each part was recorded. Spontaneous corrections were scored as correct responses. A difference score is calculated which is defined as the difference in the amount of time required for the interference task.

There are three components to the task. First, the individual is asked to name a series of color words (word task). This component is believed to reflect basic reading rate and may be affected by speech motor problems or learning disorders (Golden, 1959). Second, the
individual is asked to name the colour of a bar (colour task). As with the word task, performance may be affected by speech motor functions; it also may be impacted by the individual’s inability to name colours or colour blindness. The final task is the colour word task, where a subject is shown colour words printed in conflicting ink colours and is asked to name the colour. Theoretically, when other factors are accounted for, the colour word task is the component that is believed to be measuring both mental flexibility and the ability to inhibit a dominant response (West, 1999). The time required to read each section was used and the number of errors was also considered. Colour and word components are used to establish a base line for comparison with a colour word task. An interference score was obtained by taking the difference between the colour task and the colour word task (MacLeod, 1991).

Materials used:

1) Incongruous colour word units on a color word conflict page containing hundred color word units in lower case letters (10 color word units in each row and column)

2) 100 units of patches of color alone on a page (each patch 1 cm x 1.5 cm square) 10 units in each row and column. The orders of the colors are the same on the color conflict page. Patches of color on the color unit page and incongruous colored word units on the conflict page randomly arrange with the constraint that each unit occur once in each row or column.
3) A specially prepared scoring page to enable the tester to follow the subject for each unit and to record any kind of reading errors.

4) Ten units of demonstration card for both colors alone and incongruous color word units using the same ten colors used as on the color unit and conflict pages.

5) Stopwatch.

4.3.7 Research Design

A two group matched design. (n=348)

<table>
<thead>
<tr>
<th></th>
<th>Leg-shakers</th>
<th>Non-shakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>Females</td>
<td>87</td>
<td>87</td>
</tr>
</tbody>
</table>

4.3.8 Variables

Independent variable:
The group under study-the leg-shakers group (LS) and the matched comparison: Non leg-shakers group (NLS).

Dependent variable:
Scores on the 4 domains and 8 facets of the personality inventory (NEOPI-R).
Scores on the Padua Inventory (PI).
Error scores and time scores on the Stroop task.
Correct scores on the PASAT task.
Control/Exclusion variables:

The following persons were not included for the study.

# Any person with a history of thyroid dysfunction, streptococcal infection, rheumatoid fever, anemia, head injury, epilepsy and any type of mental illness.

# Any person with substance abuse, heavy use of caffeine and nicotine.

# Any person whose related family member suffered from epilepsy or any type of mental illness.

# Any individual whose childhood experience, could be described as, an unhappy, traumatic and crisis filled.

# Participants had a minimum age of 17 and a maximum age of 25 years.

4.3.9 Hypothesis

The group to study, that is, persons identified as leg-shakers, will be referred to as the LS (leg-shakers), and the matched comparison group as NLS (Non leg-shakers).

Hypothesis 5: The LS group will score significantly higher on Neuroticism than the NLS group.

Hypothesis 5.1: The anxiety scores will be significantly higher for the LS group than the NLS group.
Hypothesis 5.2: The depression scores will be significantly higher for the LS group than the NLS group.

Hypothesis 5.3: The angry hostility scores will be significantly higher for the LS group than the NLS group.

Hypothesis 5.4: The impulsiveness scores will be significantly higher for the LS group than the NLS group.

Hypothesis 6: The LS group will score significantly lower on Extroversion than the NLS group.

Hypothesis 6.1: The excitement seeking scores will be significantly higher for the LS than the NLS group.

Hypothesis 6.2: The positive emotions scores will be significantly lower for the LS group than NLS group.

Hypothesis 7: The LS group will score higher on agreeableness than the NLS group.

Hypothesis 8: The LS group will score higher on conscientiousness than the NLS group.

Hypothesis 8.1: The order scores will be significantly higher for LS than NLS

Hypothesis 8.2: The dutifulness scores will be significantly higher for LS than NLS.
These above hypotheses explore links between leg-shaking stereotypy and normal personality traits. The NEO-PI-R is used to measure domains of neuroticism, extroversion, open-mindedness, agreeableness and its facets reflected from H5 to H8. Affective states of the individual is often expressed via a motoric system output. When body restlessness and fidgeting are studied as behavioral trait variables, they have been correlated to a variety of personality measures.

Hypothesis 9: The interference scores will be significantly lower for LS group than NLS group.

Hypothesis 10: The rate of information processing will be significantly higher for LS group than NLS group.

An increasing number of studies have focused on detecting mild cognitive defects based on the assumption that attention and memory deficits characterize early stages of Alzheimer’s, HIV, and Multiple Sclerosis among many others. Attention differences in Tourette’s syndrome are well documented. If these disorders with motor components affect attention. These hypotheses (H9 and H10) speculate the relationship between leg-shaking and the two features of attention.
Hypothesis 11: The LS group will score significantly higher on the total Padua Inventory-PI (obsessions and compulsions) score than the NLS group.

Spontaneous dyskinesia is central to the spectrum of several psychological disorders. Obsessions and compulsions have a significant association with a variety of motor symptoms including, stereotypies grimacing, catatonia and tics. The links between movement disorders and obsessions and compulsions include anatomical and biochemical lesions affecting primarily the basal ganglia. The hypotheses H11 predicts leg-shaking to be linked with obsession and compulsions.

Hypothesis 11.1: The impaired motor control scores will be significantly higher for LS group than NLS group

Hypothesis 11.2: The checking scores will be significantly higher for LS group than NLS group

Hypothesis 11.3: The urges and worries scores will be significantly higher for LS group than NLS group.

Hypothesis 11.4: The contamination scores will be significantly higher for LS group than NLS group.
Hypothesis 12: There will be a significant correlation between the LS score and ponderal ratio.

Ponderal index is a measure of elongated versus rounded quality of body. Body shape is a known variable studied in several contexts. It affects gait, posture and body movements. This hypothesis speculates that body morphoanatomy may affect leg-shaking.

Hypothesis 13: The antecedent variable Leg-shaking will predict outcomes 1) anxiety 2) depression 3) neuroticism 4) extroversion 5) Padua Inventory total score on obsessions and compulsions.

The above assumption explores relationships between the dimensions of personality and leg-shaking and attempts to place leg-shaking in the context of these personality traits. The concept of personality disorders spectrum has emerged from research suggesting strong associations between certain personality traits and a number of illnesses. The prevalence data of OCD and a number of other disorders like Tourette's syndrome, Parkinson's disorder, Tics, Huntington's chorea, autism suggest sturdy associations between obsession and compulsions and these other disorders. This has led to a proposal that these disorders fall on an obsessive compulsive spectrum. Phenomenology, comorbidity and genetics has underlying associations between OCD, Tourette's syndrome, anxiety and depression. Levels of enthusiasm, extroversion and positive emotion have been low. By studying relationships, the existence of premorbid personality traits can be revealed thereby, further clarifying specific theoretical unifying factors.
Hypothesis 14: There will be no significant gender differences between the LS group and the NLS group on scores of anxiety, extroversion and obsessive-compulsive traits.

Trait differences have been found in personality literature between males and females. Thus a prediction was made to find out if this difference would be maintained in the two specific groups of leg-shakers and non leg-shakers.

4.3.10 Data Analysis

The analysis was carried out using the Statistical Package for Social Sciences (SPSS 10.0) In addition to descriptive statistics, correlation, Simple regression, t-tests, and 2X2 factorial ANOVA were performed.

4.4 Pedigree studies.

The main objective of pedigree analysis was to identify patterns of inheritance and to identify the phenotypic characteristics of probands sibling’s parents and grandparents. Structured diagnostic interviews were conducted with individuals in 139 families
4.4.1 Pedigree Analysis

All conclusions regarding gene action (dominant/recessive; co-dominant) have been obtained from selective breeding procedures by analyzing the results of controlled gene crosses. In some situations, like humans and higher primates, it is not possible to do so. Rather, an analysis of an existing population is conducted. This is always the case when studying human genetics. Scientists have devised another approach, called pedigree analysis, to study the inheritance of genes in humans. Pedigree analysis is also useful when studying any population when progeny data from several generations is limited. Pedigree analysis is also useful when studying species with a long generation time.

A series of symbols are used to represent different aspects of a pedigree. Below are the principal symbols used when drawing a pedigree.

- Male
- Female
- Affected individual
- Mating
- Offspring in birth order; I and II are generations; offspring
- Numbered II-1 and II-2
- Identical twins
- Non-identical twins

(Source: McClean, 2000)

Figure 1: Symbols used for pedigree analysis.
Once phenotypic data is collected from several generations and the pedigree is drawn, careful analysis will allow determining whether the trait is dominant or recessive. Here are some rules to follow.

For those traits exhibiting dominant gene action:
Affected individuals have at least one affected parent

**Dominant Pedigree**

![Dominant Pedigree Diagram]

(Source: McClean, 2000)

**Figure 2: Example of a dominant pedigree**

The phenotype generally appears every generation
Two unaffected parents only have unaffected offspring
Figure 2 is the pedigree of a trait controlled by dominant gene action.
And for those traits exhibiting recessive gene action:
Unaffected parents can have affected offspring
Affected progeny are both males and females
Figure 3 is the pedigree of a trait controlled by recessive gene action.
**Recessive Pedigree**

![Pedigree Diagram](image)

(Source: McClean, 2000)

**Figure 3: Example of a recessive pedigree**

**4.4.2 Procedure:**

In a pedigree chart, generations are represented by Roman numerals. Each person in each generation is numbered.

Males are represented by a square and females by a circle.

A horizontal line connecting a male and female is called a marriage line.

Vertical lines represent children.

Children on the vertical line are always placed from left to right, with the child on the left being the oldest.

Any person on a pedigree chart that has a shaded symbol must be assigned a dominant gene.

Place a capital letter under the person's symbol.

To determine the second gene for persons who show a dominant trait a Punnett square is drawn. Any person on a pedigree chart that has a shaded symbol must be assigned two (2) recessive genes.
Place lower case letters under the person's symbol.

Square must be used. See Figure 4.

![Pedigree chart & Punnett square](image)

**Figure 4: Pedigree chart & Punnett square**

Looking at figure 4 one can determine that the grandfather (I-1) is ee. The grandmother, has a dominant gene. By looking at her three children can one determine whether her second gene is dominant or recessive? If the grandmother were to be dominant (EE) would she be able to have a child with the genotype (ee)? By using the Punnett Square, one will be able to see that this would be impossible. Thus, the grandmother must be heterozygous (Ee).

In this case, the second gene from person II-4 cannot be predicted using the Punnett Square. Either genotype (EE) or (Ee) may be correct. When this occurs, both genotypes are placed under the person's symbol. Predicting the second gene for III-1 results in her not being able to be predicted because if one looks at the Punnett Square, she could be either (EE) or (Ee), since her father is heterozygous. At some time in the future, If II-3 and II-4 have many more children; one might be able to predict II-4. When both parents show a dominant trait
and their children all show a dominant trait, one cannot predict the second gene for anyone if only a small family is available

4.4.3 Sample:

The entire sample with the target participant was given instructions in a group setting while they drew their family tree. The investigator supervised the session closely.

The total study group included relatives who were directly interviewed. Family history information was relied on for individuals who could not be directly interviewed. This procedure may have underestimated the prevalence. In order to control for underreporting, the investigator tried to obtain information for multiple informants i.e. in instances of false negatives. In all cases the target participant’s permission to contact and consent of family was obtained.

1. A three generational complete tree was a requirement.
2. Participants had to have contact with as many members of the family as possible.
3. The investigator also had to have contact with some members of the family.

Many family trees had to be discarded because they were incomplete, or due to non-contact availability with some of the members. This is normally the case with pedigree studies. Of 139 pedigree trees only 5 trees were valid for analysis.
Table 6: Summaries of the pedigrees

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of pedigrees</td>
<td>5</td>
</tr>
<tr>
<td>Mean no of generations</td>
<td>4.2</td>
</tr>
<tr>
<td>Total no of males</td>
<td>90</td>
</tr>
<tr>
<td>Total no of females</td>
<td>97</td>
</tr>
<tr>
<td>Grand total</td>
<td>187</td>
</tr>
</tbody>
</table>

4.4.4 Hypothesis

H15: There will be no difference in the observed and expected frequency of leg-shakers in all the five pedigrees assuming that it is an autosomal dominant gene.

H16: There will be no significant difference between the number of male and female leg-shakers.

Genetics research shows high familial rates for Restless Legs Syndrome (RLS), Periodic Leg Movements (PLM), Dopa responsive dystonia, hyperlexia and Rett’s syndrome. All of these disorders have motor symptoms as primary signs. They are autosomal dominant gene disorders. In the same vein, leg-shaking may also have a genetic basis.
4.4.5 Data Analysis

1. Calculation of total affection rate.
2. Sex transmission ratio
3. Type of inheritance
4. Autosomal or sex linked inheritance

4.5 Cortisol study

Cortisol is the most important Glucocorticoid in humans. It is the end product of the hypothalamic pituitary adrenal axis. Saliva is the most popular medium for measurement of cortisol concentration, which can be easily and painlessly obtained. Cortisol remains stable in saliva for several days and so is suited to investigation in which the participant is required to provide multiple samples for the study. (Clements & Parker, 1998) Salivate sampling devices were used for saliva collections. Procedure was strictly according to the instructions given in the Instruction manual (CAN-C-290EiAsy Cortisol, 2005).

4.5.1 Principle of the test

The principle of the enzyme immunoassay test follows the typical competitive binding scenario. Competition occurs between an unlabelled antigen and an enzyme-labeled antigen (Cortisol-Horse Radish Peroxidase (HRP) conjugate) for a limited number of antibody
binding sites on the micro well plate. The washing and decanting procedures remove unbound materials. The amount of labeled cortisol left bound to the antibody is inversely proportional to the concentration of the unlabelled cortisol. A set of standards is used to plot a standard curve from which the amount of cortisol in subject samples (leg-shakers) and controls (Non leg-shakers) can be directly read.

4.5.2 Assay procedures

All reagents must reach room temperature before use. Calibrators’ controls and saliva samples should be assayed in duplicate. Once the procedure has been started all steps should be completed without interruption.

1) Prepare working solutions of the cortisol-HRP conjugate and wash buffer

2) Remove the required number of micro well strips. Reseal the bag and return any unused strips to the refrigerator

3) Pipette 50 microlitre of each calibrator control and participant samples into correspondingly labeled wells (hollow containers on a tray) is duplicated

4) Pipette 100 microlitre of the conjugate working solution into each well. (Recommended use a multichannel pipette)

5) Incubate on a plate shaker (approximately 200 rpm) for 45 minutes at room temperature.
6) Wash three times with approximately 300 microlitre of diluted wash buffer per well and tap the plate firmly against absorbent paper to ensure that it is dry.

7) Pipette 150 microlitre of TMB substrate into each well using a multichannel pipette at timed intervals.

8) Incubate on a plate shaker for 15 to 20 minutes at room temperature or until calibrator A attains dark blue colour for desired Optical density (OD)

9) Pipette 50 microlitre of stopping solution into each well using a multichannel pipette at the same timed intervals as in step seven.

10) Read the plate on a micro well plate reader at 450 nm within 20 minutes after addition of the stopping solution

If the OD exceeds the upper limit of detection or if a 450 nm filter is unavailable a 405 or 415 nm filter may be substituted. The optical densities will be lower, however this will not affect the result of subject control samples.

4.5.3 Calculations.

1.) The mean optical density of each standard duplicate calculated.

2.) A standard plot on semi-log paper with the mean optical densities on the Y-axis and the standard concentrations on the X-axis.

3.) The mean optical density at each unknown duplicate was calculated.
4.5.4 Specimen collection and storage

Approximately 1 ml of saliva is required per duplicate determination. Collect 4 to 5 ml of saliva in a clean glass tube (Salivate) without force of inducement and before eating, drinking or brushing. Simply wash mouth with water before collection. The tubes are to be placed into a freezer and allowed to freeze. When ready for use the specimens are to be thawed and centrifuged (10,000 rpm for 10 minutes). The supernatants are to be collected and poured into freshly labeled tubes.

4.5.5 Sample characteristics

Table 7: The mean, SD, df, t-values and significance between LS and NLS on Age, PR and education

<table>
<thead>
<tr>
<th>Variable</th>
<th>LS (N=10)</th>
<th>NLS (N=10)</th>
<th>df</th>
<th>t value/p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>19.51</td>
<td>20</td>
<td></td>
<td>1.52 ns</td>
</tr>
<tr>
<td>SD</td>
<td>2.02</td>
<td>2.15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ponderal ratio

| Mean          | 13.13     | 12.93      |    | 0.20 ns   |
| SD            | 2.14      | 2.12       |    |           |
| Range         | 9.11-16.60| 9.12-17.01 | 18 |

Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>LS</th>
<th>NLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Female</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Education

<table>
<thead>
<tr>
<th>Mean</th>
<th>SD</th>
<th>t value/p</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7</td>
<td>.48</td>
<td></td>
</tr>
<tr>
<td>3.6</td>
<td>.51</td>
<td></td>
</tr>
</tbody>
</table>

p>0.01
LS=leg-shakers, NLS=non leg-shakers. PR=ponderal ratio
4.5.6 Hypothesis

Hypothesis 17: Salivary Cortisol levels in leg-shakers group will not be significantly different from non leg-shakers group.

Fluctuating Cortisol levels have been linked with dyskinseas and psychotic patterns and neuromotor problems. Both high and low Cortisol levels have been reported. Hence the hypothesis predicts a different level of salivary Cortisol for the two groups.

4.5.7 Data analysis

The analyses were carried out using the Statistical Package For Social Sciences (SPSS 10.0) In addition to descriptive statistics t-tests were performed.

4.6 Pilot Study

A leg-shaking questionnaire was designed. Alpha coefficients and test retest reliability was calculated for a sample of 30 subjects. The correlations ($r_{tt}$) were 0.81 and 0.77 respectively.

Three items were adapted from the Mehrabian and Friedman (1986) fidgeting questionnaire. These items were converted from a 9-point rating scale to a 5-point scale and tested for normal distribution features of skewness and kurtosis on a group of 80 undergraduate students.

The item analysis for the 18 leg-shaking screening items was calculated. The item discrimination index was computed on the
responses given by 40 participants. (20 males and 20 females) (Refer appendix H)

Alpha coefficients and test retest reliability (5 weeks) for the NEO-PI-R, and the Padua Inventory, was calculated on a group of 40 (20 males and 20 females) Final Year undergraduate students.

**Table 8: Reliability coefficients**

<table>
<thead>
<tr>
<th>Test</th>
<th>Cronbach’s Alpha</th>
<th>Test retest reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neo PI-N</td>
<td>0.78</td>
<td>0.80</td>
</tr>
<tr>
<td>Neo PI-E</td>
<td>0.83</td>
<td>0.81</td>
</tr>
<tr>
<td>Neo PI-O</td>
<td>0.77</td>
<td>0.77</td>
</tr>
<tr>
<td>Neo PI-A</td>
<td>0.81</td>
<td>0.79</td>
</tr>
<tr>
<td>Neo PI-C</td>
<td>0.89</td>
<td>0.74</td>
</tr>
<tr>
<td>PI - Total</td>
<td>0.80</td>
<td>0.91</td>
</tr>
<tr>
<td>Factor 1</td>
<td>0.72</td>
<td>0.89</td>
</tr>
<tr>
<td>Factor 2</td>
<td>0.77</td>
<td>0.84</td>
</tr>
<tr>
<td>Factor 3</td>
<td>0.79</td>
<td>0.80</td>
</tr>
<tr>
<td>Factor 4</td>
<td>0.80</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Instructions were audio taped and field-tested for the PASAT. The two-second sequence of presentation was chosen for the final study.
To familiarize and thoroughly understand the laboratory procedure of using the salivary cortisol kit, 13 mock runs were conducted on available saliva samples.

A time course analysis for every half an hour of the examination situation was done. A detailed half an hour observations for leg-shaking was done every half an hour for five of the three-hour examination situation. Thus six half hour time zones (1st, 2nd, 3rd, 4th, 5th, and 6th) were studied. No significant differences were found between the 1st and 2nd, 3rd and 4th, 3rd and 5th, half hours. The time zones chosen for the final study were 1st, 3rd and 6th and were termed T1, T2, and T3.

An item level exploratory principal factors analysis with Varimax rotation was done. Candidate factor structures were evaluated on the basis of 1) eigenvalues, number of factors and 2) Strength of primary loading. The results were highly similar to early studies done in different countries. Several countries have provided support for the reliability and factor structure of the PI. They are Italy (Sanavio, 1988), Dutch (Van Oppen, 1992; Van Oppen, Hoekstra, & Emmel Kamp, 1993.), North America (Sternberger & Burns, 1990), Australia (Haffner, 1988; Haffner & Miller, 1990), Korea (Min, 1999), Britain (Mac Donald & D Silva, 1999), Spain (Chappa, 1998; Ibanez, Olmeldo, Penat & Gonzalez, 2002; Mataix-Cols & Sanchez, 2000; Mataix-Cols 2002) and Iran (Goodarzi & Firoozabadi, 2005).
Literature searches using the 1) Medline, 2) PsycINFO, 3) Embase, 4) ERIC 5) ETOH databases were done. Keywords used were stereotypy, motor rhythms, restlessness, fidgeting, nervous mannerisms and psychic tics.

To provide a more updated illustration of the discrepancy between the published work on OCD and Obsessive traits and compulsive traits. The search generated 103 related references. By way of comparison, the search of obsessive-compulsive personality generated 12 references. This ratio of almost 9:1 held up even after the addition of various permutations of keyword searches using PsycINFO.

Data collected prior to the registration of this thesis was documented separately and is placed in Appendix A

4.7 Summary

This chapter outlined the methodology used at the four stages of the research. The procedure used for sample selection and work done during the pilot phase of the study is explained. Rationale and the hypothesis are stated. Research design, assessment tools, data analyses are specified.