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RESEARCH DESIGN AND METHODOLOGY

RESEARCH DESIGN

Science is a method, a way of investigation and a way of looking at the world. The success and the purpose of the present research work depend upon the quality of research design. A research design is an arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose. There is no uniform pattern of research designs. Research is essentially an attitude of mind and the application of techniques in confronting a problem. The purpose of social research is the collection, analysis and generalization of data and thereby attain group of general principles underlying social facts.

The present study is based on partly descriptive and diagnostic research design. After selecting the sample and designing the methods of data collection, the essential scientific steps i.e., processing and interpretation of data, reporting of findings are followed in descriptive and diagnostic research design. Single type of research design can hardly be result oriented. Hence, application of the rest of the research designs has equally been needed to conduct scientific study of postural defects among the primary school boys of Greater Gwalior in Madhya Pradesh state.
The case study method through questionnaire schedule as well as physical testing of the boys and interview schedule have been employed for the collection of data. Appropriate scientific methods and testing procedures have been used for the identification of the postural defects so as to maintain the higher degree of reliability and objectivity. Un-structured questionnaires and interviews are usually proved more rewarding in eliciting the information, however focused interviews on certain points were also conducted. The information collected through schedules was partly coded and partly open ended depending upon the nature of information sought. The research scholar has made every effort to analyse the selected five postural defects of the boys in relation to their family background from interdisciplinary approach.

Non-participant observation technique has been used to examine the ecological conditions in which the families of posturally defected boys were living. Door to door investigation was conducted with the help of interview guide. Information has also been obtained by contacting family members, neighbours, school teachers and other available official records at the schools.
In this chapter, apart from research design as already mentioned, universe of enquiry, hypothesis, sampling, preparation and administration of questionnaire, methods adopted for detection of postural defects and their administration, procedure of processing and analysing the data, limitations, delimitations and difficulties faced during investigation are described.

UNIVERSE OF ENQUIRY

The universe of enquiry for the present research work is the vicinity of Greater Gwalior. The research scholar has identified three different types of institutions on the basis of their type of management namely, Central Government, State Government and Private Management so as to identify the postural problems representing different family backgrounds. Two schools of each type of management were selected for the investigation which were located in the different directions of Greater Gwalior. The schools selected for the study from the Centeral Government type of management were Kendriya Vidyalayas (No.1 and No.4), from State Government type were Gorakhi School and J.P. Vidyalaya and from Private Management type were Wendy School and Ram Krishna Vidya Mandir.
Hence, the scholar has to delimit the research area and the number of cases according to the time schedule.

The research scholar contacted the heads of the institutions selected for the study and requested them to make the boys available for the investigation. The heads of the institutions were ensured that the procedure involved in the collection of data would not prove to be harmful to the boys in any way, and also that the time selected for the identification of postural defects would not adversely affect the academic programme of the schools. The purpose and importance of the study in details were also explained to the heads of the institutions and to the class teacher of each section so as to ascertain full co-operation from them.

Keeping in mind the age factor of the boys, the higher primary classes i.e., III, IV and V were chosen for the study and were assembled in the respective schools. The total procedure involved in the identification of postural defects was explained to the boys. The boys were also told that the study would be of help to them by way of identifying the postural defects if they have any, so that they, under the guidance of their parents, may adopt some remedial measures to overcome these postural problems.
A total of 1069 boys from all the three types of selected institutions were examined and out of that only 210 boys were found to be posturally defected. These 210 boys suffered from a total number of 353 postural defects. The posturally defected boys suffered either from any one of the five selected postural defects namely, kyphosis, lordosis, scoliosis, knock knee or flat foot, or they had multiple postural defects.

All the boys studying in classes III, IV, and V who were present in the schools during the days of data collection were chosen for the study. In each of the selected schools, the boys exhibited a lot of enthusiasm and agreed to participate in the study with lot of zeal and interest. The class teacher of each section also extended full co-operation.

**HYPOTHESIS**

A hypothesis is an assertion that the investigator seeks to investigate. It is a proposition, condition or principle which is assumed perhaps without belief in order to draw out its logical consequences and by this method, to test its accord with facts which are known.
According to Lundberg¹ “A hypothesis is a tentative generalization, the validity of which remains to be tested .........., the hypothesis may be any hunch, guess, imaginative idea which becomes the basis for action or investigation”. Thus, it is a proposition which can be put to a test to determine the validity. The use of hypothesis thus prevents the blind research and indiscriminate gathering of data which may later prove irrelevant to the problem under study. Hypothesis may also be developed from the various sources.

The present research work is aimed at analysing, supporting or rectifying many commonly held notions about the postural defects of primary school boys of Greater Gwalior. It may be hypothesized that the occurrence of five common postural defects namely, kyphosis, lordosis, scoliosis, knock knee and flat foot in primary school boys is related to the family background of the individual. There may be a trend of less prevalence of selected postural defects among the rich, educated and upper socio-

economic families than that of relatively poor, uneducated, backward and lower socio-economic background families.

Before making the above hypothesis, the scholar made an extensive study of the literature and discussed with the experts in the fields of orthopaedics, sports medicine, physical education and social science.

The following important aspects of postural defects were kept in the mind before selecting the postural defects for the study:

I. The impact of postural defects on the bodily growth and development of young children.

II. The impairment caused by the defects on the locomotion and functions of the body.

III. Effect of postural defect on aesthetic appearance of the individual.

IV. The impact on the mechanical efficiency and energy expenditure in relation to the execution of essential tasks of daily life.

On the basis of the above and research scholar’s own experience and knowledge of physiotherapy profession, the following five postural defects were selected for the study:
1. Kyphosis

2. Lordosis

3. Scoliosis

4. Knock knee

5. Flat foot.

Some of the postural defects namely, bow leg, flat back, round shoulders and pronated feet etc. were not considered to be selected for the investigation because of their relatively less prevalence, less negative impact on human body and also for the administrative feasibility.

The following factors of family background were chosen for the study after discussion with the learned supervisors:

1. Family type and composition

2. Caste

3. Religion

4. Dwelling conditions

5. Occupation

6. Economic status

7. Educational status of the parents.
SAMPLING

One of the most important as well as the most difficult problem in research project is the problem of sampling. There can be two ways of conducting the research. In the first one, the scholar adopts the way of census of survey by which each and every unit is to be studied and thereafter the conclusions are drawn. But this is quite time consuming and costly technique. Sometimes because of undue delay the results may also be affected. In the second one, a micro and intensive study is to be conducted through sampling technique which is early result oriented. In the sampling technique some units are taken as representatives of the whole universe and the conclusions of these sample units are extended to the whole field. Sampling technique not only saves time but also money and makes investigation possible in a micro study manner. Goode and Halt\(^2\) very aptly remarked, “A sample as the name implies, is a smaller representative of a large whole.”

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Thus, sample is a device for learning about large area by studying a few units. The universe of the present research work being the Greater Gwalior, it was not possible for the investigator to examine and interview all the posturally defected boys of all the primary schools of Greater Gwalior due to lack of proper resources and time, hence, two schools from each type of their management i.e., Centreal Government, State Government and Private Management having their opposite locations in Greater Gwalior were selected and stratified random sampling technique was employed to conduct micro study of the posturally defected boys.

Therefore, the research scholar has randomly taken 1069 primary school boys studying in III, IV and V classes in these schools for the intensive study. The questionnaire schedule was employed for collecting the data pertaining to family background of the boys. The parents of these boys were also contacted at their residence. 1069 boys of aforesaid schools were examined to study if they had any postural defect (kyphosis, lordosis, scoliosis, knock knee or flat foot) for which appropriate testing procedures were adopted.
PREPARATION OF QUESTIONNAIRE SCHEDULE

For preparation of the questionnaire following steps were adopted:

1. **Initial draft**

   In consultation with the experts in the field of sociology, education and economics the research scholar prepared a draft questionnaire so as to cover all the essential components of the family background of the boys. The important components were: (i) family type and composition (ii) caste (iii) religion (iv) dwelling conditions (v) occupation (vi) economic status and pattern of expenditure and (viii) educational status of parents.

2. **Trial draft**

   The questionnaire developed by the research scholar was given a trial run by administering it to five boys from each of the selected schools so as to ensure that all the questions were clear to the boys and there was no ambiguity in any of the questions asked. As a part of the trial run the boys were also asked to carry the questionnaire home and fill it up in consultation with their parents.
3. **Modification of the questionnaire schedule**

In the light of the suggestions given by the boys, the questionnaire was re-drafted and all the ambiguities and points causing confusion were eliminated and ultimately a final questionnaire was prepared for administration to all the boys chosen for the study.

**ADMINISTRATION OF QUESTIONNAIRE SCHEDULE**

In order to determine the family background of the boys, the research scholar with the help of post graduate students of Lakshmibai National Institute of Physical Educaion, Gwalior, and respective class teacher distributed the final questionnaire to all the boys studying in III, IV and V classes in the selected schools. The boys were asked to carry the questionnaire home so that they could fill it up in consultation with their parents. Each class section was assembled in the presence of class teacher and the questionnaires were distributed to them. The boys were urged to bring back the questionnaire within three days and the research scholar and the post graduate students again visited the selected schools for the collection of the questionnaires.
The boys and their parents were requested to ensure that the information furnished by them would be kept confidential with the research scholar and to be utilized only for the purpose of the research work.

**METHODS OF DETECTION OF POSTURAL DEFECTS AND THEIR ADMINISTRATION**

The research scholar carried spondylograph and pedographs along with him to the selected schools to collect the required data. After the questionnaires were collected from the boys, they were briefed regarding good and bad posture and were also explained about the importance of good posture for the health, personality and efficiency. The measurements were taken with the help of the postgraduate students of Lakshmibai National Institute of Physical Education, Gwalior. The respective physical education and class teachers were also of great help while the measurements were taken.

The following gadgets and methods were adopted for the detection of postural defects:

1. Spondylograph, for detection of kyphosis, lordosis and scoliosis
2. Indian Army Doctor’s method, for detecting knock knee
3. Pedograph, for detecting flat foot.
Spondylometer

The spondylometer is a useful and reliable instrument for recording the spinal posture and detecting spinal postural defects namely kyphosis, lordosis and scoliosis. The proper measuring of the spinal deformity is the most important factor in the initial assessment. Curves are named according to the region of the spine in which the apex of the curve is located. The cervical curve is a curve of the apex between C1 and C6, the dorsal curve of the apex between T2 and T12 and the lumbar curve is one with an apex between L1 and L4\(^3\).

The most significant deviations from a normal spinal posture result from the loss of the secondary spinal curves; with the elimination of first the lumbar and later the cervical lordosis. The thoracic curve is exaggerated and the spine becomes progressively rounded.

\(^3\)Nigel H. Harris, ed. Post Graduate Text Book of Clinical Orthopaedics (Bristol: John Wright and Sons Ltd., 1983), pp. 49-50.
The spondylometer has a base of platform, long vertical rod, and horizontal adjustable pegs. The boy stood on the base of the spondylometer in an upright "most erect posture" he could assume. The heels touched the base of the upright. Pegs spaced at 2 cms intervals in the upright were adjusted to make light skin contact over the vertebral spines and locked in position. Measurements at boy's seventh cervical level and for depths of curvature of thoracic and lumbar regions were taken. The distances of protrusion of the pegs from the upright were measured and the readings were noted down to determine the angles of the curves of the spine (depths of curvature) in order to find out any deviations in the posture^4.

Instrument Reliability

In as much as the spondylometer, the instrument used for identification of spinal postural defects namely, kyphosis, lordosis and scoliosis was not available at Greater Gwalior, the research scholar had a meeting with Sports Medicine expert at Lakshmibai National Institute of

Physical Education, Gwalior and after having gone through the available literature, a decision was taken to get the spondylometer fabricated in the work-shop of Lakshmibai National Institute of Physical Education, Gwalior. The services of an experienced and trained carpenter were utilized for constructing the spondylometer as per the specifications provided to him. After getting the instrument fabricated, the same was shown to the expert and only after seeking his approval the instrument was used for the collection of data. All parts of the spondylometer i.e., the vertical bar, the horizontal adjustable pegs, the plat form and the holes on the vertical bar were measured in the presence of the expert so as to ensure the reliability for collection of data. The measurements of different parts of the spondylometer were as following:

Platform - 60cms by 40cms

Length of the vertical bar - 1.5m

Length of the peg - 20cms

Distance between the holes - 2cms.

After having seen the instrument the expert certified that the instrument would ensure collection of reliable data.
Test Reliability

The research scholar took a number of measurement sessions under the guidance of the expert to ensure accuracy of measurements. Finally, to ensure tester’s reliability in taking measurements five boys were tested by the research scholar in the presence of the expert. The expert was fully satisfied with the manner in which postural defects were identified and measurements recorded.

Indian Army Doctors’ Method for detection of Knock knee

Indian Army Doctors’ Method\textsuperscript{5} was considered as an appropriate measure for the detection of knock knee deformity. It is a very simple and inexpensive method used for the purpose.

Pedograph

The foot print is taken as the criterion for the detection of flat foot. The foot print may be made with a pedograph or with home made devices. The pedograph is inexpensive, highly reliable and objective method for measuring the height of longitudinal area and therefore, the flat footedness of an individual\(^6\).

Kyphosis, Lordosis and Scoliosis

Equipment:

Spondylometer.

Procedure:

The curves of thoracic and lumbar regions were taken as criterion for the detection of kyphosis and lordosis respectively. After briefing each boy for the use of spondylometer, the marked pegs were fixed in the holes made at a distance of 2 cms on the spondylometer at levels corresponding to boy's seventh cervical, apex of thoracic and lumbar

curves which were marked with ink for clear showing. The boy was made to stand with only shorts on and bare-footed on the marked base of the spondylometer. The boy was also made to stand in relaxing position with straight neck and body against the pegs fixed over the vertical rod of the spondylometer. The boy was allowed to stand for about five minutes in order to notice his habitual standing posture before measuring and recording the marked pegs for above three levels. Detection of kyphosis, lordosis and scoliosis with the help of spondylometer is shown in photo - 7.

Scoring:

For kyphosis, scoring was done on norms worked out by taking a difference of peg measurements recorded for the levels of seventh cervical and apex of thoracic curve. Similarly, for lordosis, the difference of peg measurements for seventh cervical and apex of lumber curve was taken. For scoliosis, the vertical alignment of the spine (vertebrae) was observed on the spot. If the ink marked vertebrae were not in accurate opposition to that of the pegs of the spondylometer, the boy was considered to be having scoliosis.

Photo. 7. Showing detection of kyphosis, lordosis and scoliosis with the help of spondylometer.

Procedure:

The footprint was taken as the criterion for the detection of flatfootedness of an individual. Before taking the footprint, the boy was given
Knock knee

Equipment:

Indian Army Doctors' Method

Procedure:-

It was tested in standing position. The boy was asked to stand in normal position looking straight ahead and his both feet just side-touching at the levels of metatarsal heads and heels. If the gap between both the knees was less than 5 mms. or medial femoral condyles touched or overlapped each other, it was considered that the boy had knock knee defect. Detection of knock knee using Indian Army Doctors' Method is shown in photo. - 8.

Flat foot

Equipment:

Pedograph

Procedure:-

The foot print was taken as the criterion for the detection of flat footedness of an individual. Before taking the foot-print the boy was given
The foot print angle was measured as following:

Photo. 8. Showing detection of knock knee with the help of Indian Army Doctors' Method.

1. Drawing a line to represent the medial border of the foot between the points of the imprint at the base of the first metatarsal bone (base of big toe) and the calcaneous or heel bone.

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detailed instructions regarding the use of pedograph. Foot prints were taken on a pedograph with the help of an ordinary picture frame over which a light rubber sheet was stretched. The finger print ink was evenly rolled on the undersurface of the rubber sheet with the help of an ink-roller. A white plain paper was placed on the floor underneath the frame and the boy was asked to stand barefooted on the top side of the rubber sheet and press both the feet. Thus, a clear impression of the feet was taken on the white paper. The boy was asked not to move the body parts unduly while standing on the picture frame.

With the help of the foot print the foot print angle was measured for all the selected boys. On the basis of the foot print angle, all the boys were divided into two groups: the normal group and of those suffering from flat footedness.

The foot print angle\(^8\) was measured as following:

1. Drawing a line to represent the medial border of the foot between the points of the imprint at the base of the first metatarsal bone (base of big toe) and the calcaneous or heel bone.

2. Locating the point where this line first touched the inner side of the imprint at the base of the first metatarsal bone.

3. Then, with a ruler held on this point, swinging it down from the toe until it just touched the edge of the print on the inside of the arch and drawing a line from the point across the point. No white paper was shown between this line and the point.

4. Measuring the angle at the junction of the two lines with a protractor. Fig. 1. shows the foot print angle being measured for the detection of flat foot.

**Identification of Boys Having Postural Defects**

For the identification of selected postural defects among the primary school boys the collected data were statistically analysed by computing means and standard deviations for each postural defect score separately for kyphosis, lordosis and flat foot. To identify boys suffering from these postural defects one standard deviation on either side of mean was taken. Those who fell within mean ± 1 S.D. were treated as normal boys and all others were considered as having defects i.e., kyphosis, lordosis or flat foot. The following table shows the means and standard deviations for the three postural defects:
Fig. 1. Showing foot print angle being measured for detection of flat foot.
Table - 1

MEANS AND STANDARD DEVIATIONS FOR KYPHOSIS, LORDOSIS AND FLAT FOOT

<table>
<thead>
<tr>
<th>Postural defect</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyphosis</td>
<td>2.8 cms.</td>
<td>0.6 cms.</td>
</tr>
<tr>
<td>Lordosis</td>
<td>0.6 cms.</td>
<td>0.2 cms.</td>
</tr>
<tr>
<td>Flat foot</td>
<td>29°</td>
<td>8°</td>
</tr>
</tbody>
</table>

Scoliosis and knock knee were detected by the spot observation of the boys using the appropriate tests. For each of these two defects, the boys were separately divided into two groups i.e., either suffering from the defect or being normal without possessing a defect.

Three hundred fifty three postural defects were detected among two hundred and ten boys. Some of the boys suffered from multiple defects. The occurrence of all the five selected postural defects investigated is given in the following table:
Table - 2

SELECTED POSTURAL DEFECTS WITH THEIR NUMBER OF OCCURRENCE

<table>
<thead>
<tr>
<th>Postural Defect</th>
<th>Number of occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyphosis</td>
<td>61</td>
</tr>
<tr>
<td>Lordosis</td>
<td>46</td>
</tr>
<tr>
<td>Scoliosis</td>
<td>79</td>
</tr>
<tr>
<td>Knock knee</td>
<td>77</td>
</tr>
<tr>
<td>Flat foot</td>
<td>90</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>353</strong></td>
</tr>
</tbody>
</table>

PROCESSING OF DATA

After the relevant data and information were carefully collected according to the nature of research work, the processing and analysis of data were carried out to reach some conclusions. Processing of data involves a number of closely related operations with a view to draw
answers to the research questions. In nutshell it refers to consolidation, recasting or regrouping of data so that the job of analysis is made very easy. The most important factor to be considered in processing the data is the correlation of the nature of the data and the techniques of data-processing. There are three main important stages of data processing. Editing is the first stage which refers to the checking of questions for completeness and accuracy. Coding is the second stage which transforms the voluminous data into numerical form. Lastly, tabulation implies comparative study of different variables by means of statistical techniques. In fact, the tabulation means the orderly arrangement of data in columns and rows. As such, the data collected for the present study were systematically tabulated for the analysis.

ANALYSIS OF DATA

Analysis of data is one of the most skilled aspects of the research work. Proper analysis requires a familiarity with the background of the field work and with all of its stages. The present research work is mainly based on the field survey. The data collection has been done through various research techniques.

In order to ascertain the relationship of family background with the postural defects among the primary school boys, the descriptive analysis
was carried out. Frequencies for each of the component of the family background were converted into percentages and prevalences of postural defects were described in relation to family background aspects of the individuals.

LIMITATIONS AND DELIMITATIONS

The present research work has been conducted with certain limitations with a view to have early results of the research. These limitations are as following:

1. Keeping in mind the time available for completing the study, only five common postural defects namely, kyphosis, lordosis, scoliosis, knock knee and flat foot have been detected in different family background groups.

2. Non-availability of sophisticated instruments for identifying postural defects may be treated as a limitation for this study.

3. The present study has been confined to find out the relationship between the five common postural defects and family background but did not take into consideration the causes responsible for these defects.
4. Family members of the selected boys have also been contacted only for the purpose of the study.

In as much as the present study covers a vast area, the following delimitations have also been taken into consideration:

1. The study was delimited to the primary school boys of three different types of institutions of Greater Gwalior managed by the Central Government, State Government and Private Management.

2. The study was delimited to 8 to 12 year age group boys studying in classes III, IV and V.

3. The study was delimited to five common postural defects i.e., kyphosis, lordosis, scoliosis, knock knee and flat foot.

4. For the purpose of the study a boy suffering from any type of the selected defects was considered to be posturally defected. Similarly, a boy was taken as posturally defected whether he suffered from only one type of the defect or had multiple defects altogether.

**DIFFICULTIES FACED DURING INVESTIGATION**

There are different types of difficulties faced by the research scholar during the investigation. One of the greatest difficulties faced in the beginning of the investigation was to convince and seek co-operation of the
school authorities. Once the objectives, need and importance of the study were explained to them, they were rather enthusiastic and more helpful.

Establishment of rapport with the boys to be studied had really been quite difficult. Though the boys belonged to younger age-categories, examining them bare footed and removal of their upper dresses for detection of defects elicited some resistance and hesitation on their part. After they were explained that the examination would help in identifying postural defects, if they had any, and that the remedial measures thereof would also be suggested, the boys became more co-operative. Sometimes the boys were required to be motivated to get maximum co-operation from them.

The filling and recording the questionnaire forms in time from the respondents was of the utmost difficulty. Many times some of the boys did not take the forms home or failed to fill it up with the help of their parents. Some of the parents did not want to disclose their familial confidentiality for the social stigma, or quite often the data related to their income, occupation, educational status etc., were received unfilled. Forwarding letter with the questionnaire and only after convincing and assuring the boys with the help of class teacher and physical education teacher, the returning of the questionnaire sheets was ensured. A special note was mentioned with a request to the parents that the information
furnished by them would only be utilized for the research purpose and would be kept with the scholar himself who would maintain all the confidentiality. The boys were also repeatedly explained the same and were asked to convey it to their parents.

While gathering data related to the family background, the scholar had to sometimes stay on odd hours with the families of the boys or with his acquaintances.

Ultimately playing and making fun with the boys at times created a friendly environment which inculcated their confidence in the research scholar and thus full co-operation was sought. The class teachers and physical education teachers were of great help throughout the data collection.