

AN INVESTIGATION INTO ESSENTIAL ASPECTS OF POSTURE IN PRIMARY SCHOOL BOYS AND MALE SENIOR EXECUTIVES

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ABSTRACT

The purpose of this study was to investigate the incidence and extent of postural defects in a group of 43 middle aged senior executives from two large companies, and 58 primary school boys from rural areas. The first group had a sedentary lifestyle while the second was selected to attend an annual sports training workshop at the Sports Institute of the University of Pretoria. Postures of the subjects were analysed by means of photographic images using the pro forma of Barlow (1956, 1990). The majority of the executives had malposture with 2.3%, 23.3%, 58.1% and 16.3% and 6.3% of the subjects being categorised with slight postural defects, severe postural defects, very severe postural defects and gross deformity, respectively. The values of the primary school boys for the same categories were 3.4%, 20.7%, 48.3% and 27.6%. None of the subjects studied was categorised as being without any postural defects. The results support others in this field (Cochrane, 1924; Dart, 1947; Kiernander, 1956; Lawson-Wood & Lawson-Wood, 1977; Barlow, 1990) who observed that malposture is common in both children and adults. The most common postural defect found in both groups were kyphosis (100% in adults and 89.7% in primary school boys) and lordosis (70% in adults and 93.1% in primary school boys). Barlow (1956; 1990) in a study on various groups, found that students in Physical Education had worse postures than other students. In the present study 75.9% of the primary school boys had either very severe postural defects or gross deformity against a value of 62.4% in the male senior executives, supporting the findings of Barlow (1956; 1990) to some extent.

Keywords: Posture; Slight-; Severe-; Very severe postural defects; Male senior executives and primary school boys.

INTRODUCTION

Malposture is pandemic in modern society (Sherrington, 1946; Dart, 1947; Lawson-Wood & Lawson-Wood, 1977; Rolf, 1977). Dart (1947) and Barlow (1955) both emphasised the fact that faulty posture was a prevalent condition of the human body affecting, for example, between 70% and 95% of children up to the age of 18 years (Barlow, 1990). In 1924 Cochrane (1924) drew attention to Swain's declaration that he saw no more than 20 well-postured individuals among 3000 patients at a sanatorium, and at a training camp for youths and men he found that 75% were physically inefficient. This is in contrast with the findings of Fenton (1973), who found that 9% of children in his study were over-curved when standing, 17% leant forward or backward when standing and at least 5% had a noticeable lateral curvature of the spine. The extent of this problem in children and adults in this country is not known at present. Lack of body awareness, modern sedentary lifestyle, stress, poor use

are to be blamed for this unfortunate state of affairs (Dart, 1947; Rolf, 1977; Feldenkrais, 1985; Alexander, 1987; 1996).

A common misconception is that regular participation in physical activity and sport leads to good posture. This was pointed out by Alexander in 1910 (Alexander, 1996), and was supported by Feldenkrais (1985) and studies done by Barlow (1956; 1990). Alexander (1996), Barlow (1956; 1990), Dart (1946; 1947; 1950), Feldenkrais (1985), Janda and Schmidt (1980), Jull and Janda (1987), Lowen (1994), Richardson (1992) and Rolf (1977) were of the opinion that malposture has as its root imbalances in different aspects of the human makeup. These imbalances may be found in the musculature (Alexander, 1932; 1996; Janda & Schmidt, 1980; Feldenkrais, 1985; Jull & Janda, 1987; Richardson, 1992), the psyche (Jones, 1979; Feldenkrais, 1985; Painter, 1986; Lowen, 1994; Alexander, 1996) and the fascia (Rolf, 1977). Be it as it may, imbalances are reflected in how the body is aligned, carried, used and in its muscular tension (Jones, 1979; Barlow, 1990).

The purpose of this study was threefold: Firstly to look into the incidence and extent of malposture in South African subjects, and secondly to investigate posture in subjects which are exposed to stressful lifestyles, and therefore in a group in which postural problems are most likely to be found (Barlow, 1959). Thirdly, the posture in young primary school boys was also investigated. The reason for the inclusion of the latter group into the study was to look into the incidence of malposture in young individuals, and to determine the potentially beneficial effects of exercise on posture in subjects who regularly participated in physical exercise.

METHOD

Subjects

The subjects of the first part of the study consisted of 43 white male senior executives from two large companies in the Pretoria area. The ages of the subjects ranged from 31 to 61 years, with a mean age of 44.5 years. The subjects were included in the study because of their excessively sedentary lifestyles.

The subject population of the second part of the study consisted of 58 white male primary school boys who participated actively in sport. The subjects were selected on the basis of their sport performances by their schools to attend an annual Vleissentraal Sport Junior coaching clinic at the Sport Institute of the University of Pretoria in one of the following codes: Tennis, gymnastics, athletics (track and field) and swimming. None had had back surgery or other major health problems. Their ages varied between eight and 12 years with the mean age of 11.3 years. All subjects agreed to participate in the study and signed an informed consent form.

Postural analysis

All data was obtained by the use of photographs. The equipment consisted of a Pentax camera mounted on a tripod. In order to minimize image distortion a Takumar zoom lens, set at a focal length of 85 millimetres, was used. Images were recorded on black and white film.

A plumb-line was brought on permanently against the wall and followed through on the floor

with a 2cm wide strip. The subjects were instructed to stand comfortably in front of the plumb-line with the floor-line between the feet, and with the arms hanging at the sides. The subject was photographed from the front, the back and each side at a distance of 4.5 metres. The subjects were instructed to assume a typical stance, the one they usually stood comfortably in, with arms hanging at their sides. The posture had to be the habitual standing posture with no aim towards the ideal. The subjects were then photographed laterally from both sides, and also from the front and from the back. A total number of 404 photographs were intensively evaluated and scrutinized by a panel of experts which had extensive training and experience in the field of postural defects. The principle of consensus among the experts themselves was used to get to an objective evaluation of the postural defects.

The analysis of the photographic prints was done, based on the pro forma suggested by Barlow (1956; 1990), which is a useful guide in assessing a given subject's postural defects and the associated muscular tension. Details of this pro forma will be found in Tables 3 and 5. This pro forma enables one not only to analyse the subject's posture, but also the relationship and position of the various body parts in relation to each other and the tension in the body musculature needed for the maintenance of this posture. Defects were scored in different body segments on a basis of one, two or three marks according to the severity of the defect, with 1 denoting a slight-, 2 a moderate- and 3 a severe postural defect using examples from Barlow (1990) and Robinow *et al.* (1943) as guidelines. At the end all the scores were added in order to get to the total score. The lower the total score the nearer to the attainment of *poise* (Dart, 1947; Barlow, 1956; 1990). According to the use of their bodies, the quality of the subject's total body posture was assessed according to the categories shown in Table 1. A total score ranging between 0-3 indicated excellent posture or use of the different body structures in relation to each other (Alexander, 1932). It also indicated what Dart (1947) referred to as *poise*, which is a state of balance in a well functioning body. Scores of 4 and higher indicated the presence postural defects with scores of 15 and higher indicating gross postural deformity (Barlow, 1956).

TABLE 1. CLASSIFICATION AND SCORING OF BODY USE AND DEFECTS

USE	TOTAL SCORE
Excellent use / <i>poised</i>	0-3
Slight postural defects	4-5
Severe postural defects	6-9
Very severe postural defects	10-14
Gross deformity	15 and over

RESULTS

Postural defects and their incidence in male senior executives

Of the group of 43 male subjects none had excellent use (*poise*), only one subject was classified as having slight defects (score 5), while more than half of the group had severe and very severe defects according to their total scores. The mean total score was 11.8 of which the lowest was 5 and the highest 21. The mean score of almost 12, placed the subjects studied in the category of very serious defects (Table 2).

TABLE 2. INCIDENCE AND SEVERITY OF POSTURAL DEFECTS IN MALE SENIOR EXECUTIVES

POSTURAL DEFECTS	NUMBERS	PERCENTAGE
Excellent use/ <i>poised</i>	0	0
Slight postural defects	1	2.3
Severe postural defects	10	23.3
Very severe postural defects	25	58.1
Gross deformity	7	16.3

Occurrence and mean score of postural defects in the various body segments

Postural defects in the various body segments, their mean score, as well as their occurrence in the sample are listed in Table 3. Mean scores were calculated according to the formula:

$$\text{Mean score} = \frac{\text{Total score}}{\text{Number of subjects with defects}}$$

This score is therefore an indication of the severity of the postural defect in a segment. Mean scores were low, ranging from 1.0 to 1.4, while postural faults occurred in all body segments. The highest incidence of postural defects was observed in the back, shoulders and the neck, with kyphosis a problem present in all the subjects studied.

TABLE 3. OCCURRENCE AND MEAN SCORE OF POSTURAL DEFECTS IN DIFFERENT BODY SEGMENTS

REGION	FAULTS	% OF CASES	MEAN SCORE
Head	Poked	14	1.2
	Retracted	79	1.1
	Tilted backwards	51	1
Shoulders	Raised	77	1.4
	Rotated	9	1.3
	Pulled together	33	1.1
	Dropped	14	1.2
Pelvis	Tilted forwards	42	1.3
Spine	Kyphosis	100	1.3
	Lordosis	70	1.8
	Scoliosis	72	1.4
	Thorax displacement	47	1.2
Stance	Forward inclination	81	1.4
	Hyperextended knees	86	1.1
	Internal rotation of knees	12	1
	Asymmetry	58	1.2
Tension	General	9	1.3
	Local	84	1.1

None of the subjects appeared to have a comfortable, balanced stance. A tight, "holding on" type of stance was the general posture. Typical examples of standing postures in the sample is shown in Figure 1.

In Figure 1a and 1b examples of the postural outcomes of scoliosis is shown. In the subject shown in Figure 1b, torsional rotation in response to spinal scoliosis is particularly evident. In Figure 1c the upright posture is maintained by means of excessive muscle tension. The subject in Figure 1d leans far forward, putting unnecessary strain on his lower calf muscles.

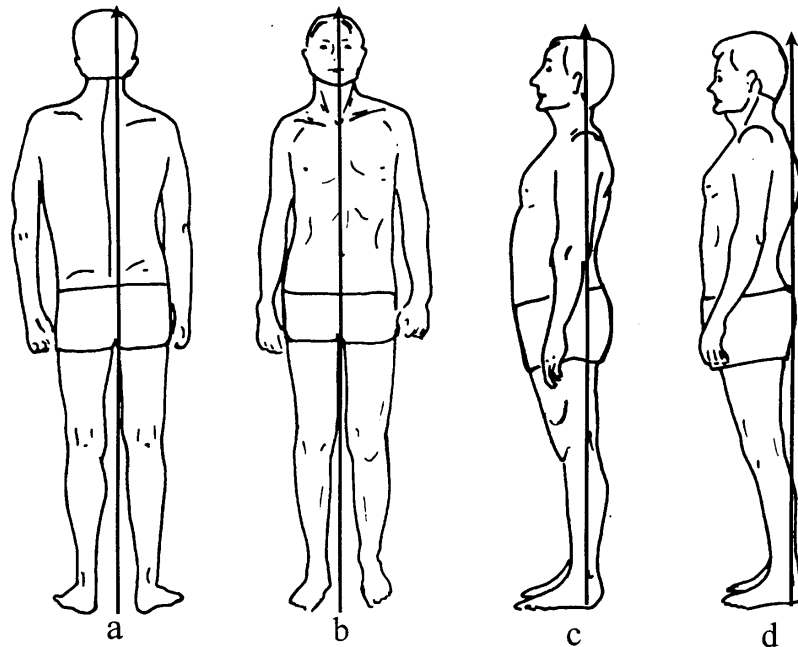


FIGURE 1. EXAMPLES OF SOME OF THE POSTURES ASSUMED BY SUBJECTS

Figure 2 shows different ways of carrying the upper quarter in 6 subjects - in all the examples head and neck position are maintained by means of excessive muscle tension, a feature which is evident in the tight shoulder and neck muscles, and which contributed to the high incidence of localized tension (Table 3).

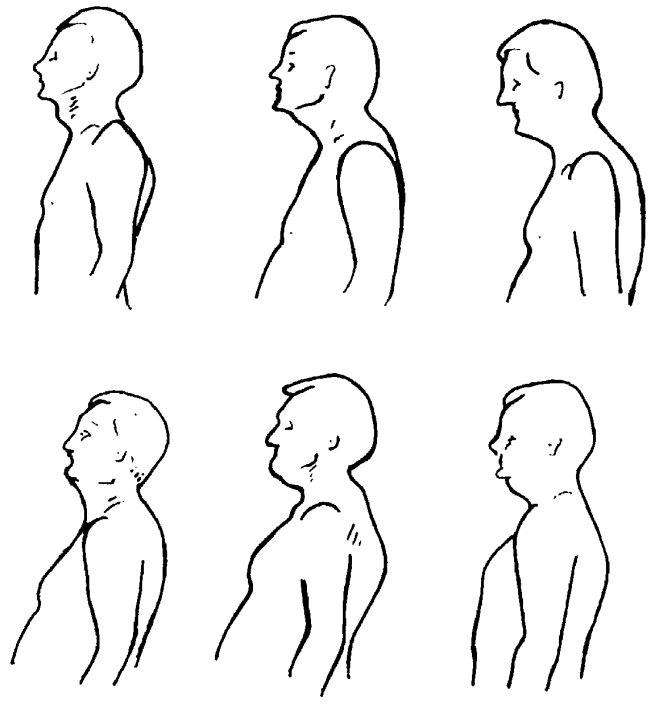


FIGURE 2. HEAD AND NECK POSITION IN SIX SUBJECTS, SHOWING THE VARIABILITY IN WHICH HEAD CARRIAGE IS BEING DEALT WITH IN DIFFERENT INDIVIDUALS

Posture and postural defects in primary school boys

In Table 4 the incidence of the various postural defects is shown. None of the subjects had excellent use and only two had slight postural defects (3.4%). Severe postural defects were found in about a fifth of the subjects (20.7%), while nearly half of the subjects had a total score which put them in the very severe postural defect category. Gross deformity was found in 27.6% of the subjects.

TABLE 4. OCCURRENCE AND INTENSITY OF POSTURAL DEFECTS IN PRIMARY SCHOOL BOYS

USE	NUMBERS	PERCENTAGE
Excellent use / <i>poised</i>	0	0
Slight postural defects	2	3.4
Severe postural defects	12	20.7
Very severe postural defects	28	48.3
Gross deformity	16	27.6

Postural faults in the various regions of the body are shown in Table 5. The greatest number of faults was found in the spine and pelvis, kyphosis being present in 89.7%, lordosis in 93.1% and a forward tilting pelvis in 95% of all subjects. Forward inclination was found in 86.2% of the individuals.

Asymmetry in body segments while standing was found in an unusually high percentage of the subjects (84.5%), which indicates a large incidence of muscle-imbalance, especially when associated with a nearly 40% occurrence of scoliosis. General tension was observed in 55% of the subjects while local tension was a common occurrence (88%), which was mainly present in the upper quarter.

TABLE 5. OCCURRENCE AND MEAN SCORE OF POSTURAL DEFECTS IN DIFFERENT BODY SEGMENTS

REGION	FAULTS	% OF CASES	MEAN SCORE
Head	Poked	31	1.2
	Retracted	32.8	1.1
	Tilted backwards	52	1
Shoulders	Raised	74.1	1.6
	Rotated	51.7	1
	Pulled together	15.5	1.2
	Dropped	17	1
Pelvis	Tilted forwards	95	1.3
Spine	Kyphosis	89.7	1.4
	Lordosis	93.1	1.6
	Scoliosis	39.7	1
	Thorax displacement	60.3	1.1
Stance	Forward inclination	86.2	1.3
	Hyperextended knees	24.1	1
	Internal rotation of knees	31	1.1
	Asymmetry	84.5	1
Tension	General	55.2	1.3
	Local	87.9	1.4

DISCUSSION

Posture in male senior executives

The purpose of the first part of the study was to investigate the postural consequences of modern Western lifestyle characterized by a sedentary lifestyle (National Institutes for Health, 1997), lack of body awareness, stress and poor use of body mechanics (Dart, 1947; Barlow, 1959; 1990; Rolf, 1977; Feldenkrais, 1985; Alexander, 1987; 1996). The results of this part of the study support the other workers who were of the opinion that malposture is pandemic (Sherrington, 1946; Dart, 1947; Lawson-Wood & Lawson-Wood, 1977). Apart from the high percentage of subjects with severe and more than severe postural defects (97.7% Table 2) analysis of Table 3 indicates an alarming tendency in that more than one postural defect per body segment was a common occurrence. Examples of this are the high incidence of head

retraction (79%) with 51% of the heads tilted backward. Kyphosis was found in all of the subjects. This was associated with a 70%, 72% and 47% incidence in lordosis, scoliosis and thoracic displacement, respectively. Scoliosis starts to develop at the age of 6 years, and progresses with advancing age (Farkas, 1941). The high incidence (72%) of scoliosis in the subjects of the present study is about twice as high as the estimated incidence (about 30%) in school children (Dickson, 1983), thus supporting Farkas' (1941) findings.

Local muscular tension was observed in 84% of the subjects, mainly present in body areas where muscle imbalance would be expected (Jull & Janda, 1987). This tension in different areas of the body can be seen in all of the subjects in Figures 1 and 2. Prominent here are tension in the neck, shoulder area and upper back (expressed for example in the 79% occurrence of retracted necks and a 100% incidence of kyphosis). With the exception of 1 subject, none of the subjects in the present study were able to maintain body alignment without undue muscular tension. Barlow (1959: 345) was of the opinion that this constitutes an additional stress:

Muscular hypertension, then, is the residual tension and postural deformity which remains after stress activity, or after any other activity for that matter, since any activity which leaves residual muscular tension is to that extent a stress activity.

Comparison of the postural faults in the subjects of the present study with those made by Barlow (1956; 1990) on drama and physical education students (Figure 3) presents a bleak picture. The incidence of individuals with very severe postural defects and gross deformity are higher than that found in Barlow's (1956; 1990) subjects.

The findings of this study indicate that middle-aged, mainly sedentary males generally have poor postures. In the light of the foregoing research, it can be assumed that the faulty postures are due to misuse of the bodies (Alexander, 1932; Feldenkrais, 1985; Rolf, 1977), and an inability to deal with physical and emotional stress. The subjects would not be able to perform certain movements adequately or easily, and there is also a possibility that minor pains of the moment might develop into pathologies in the future (Barlow, 1959; Goldthwait, *et al.*, 1952).

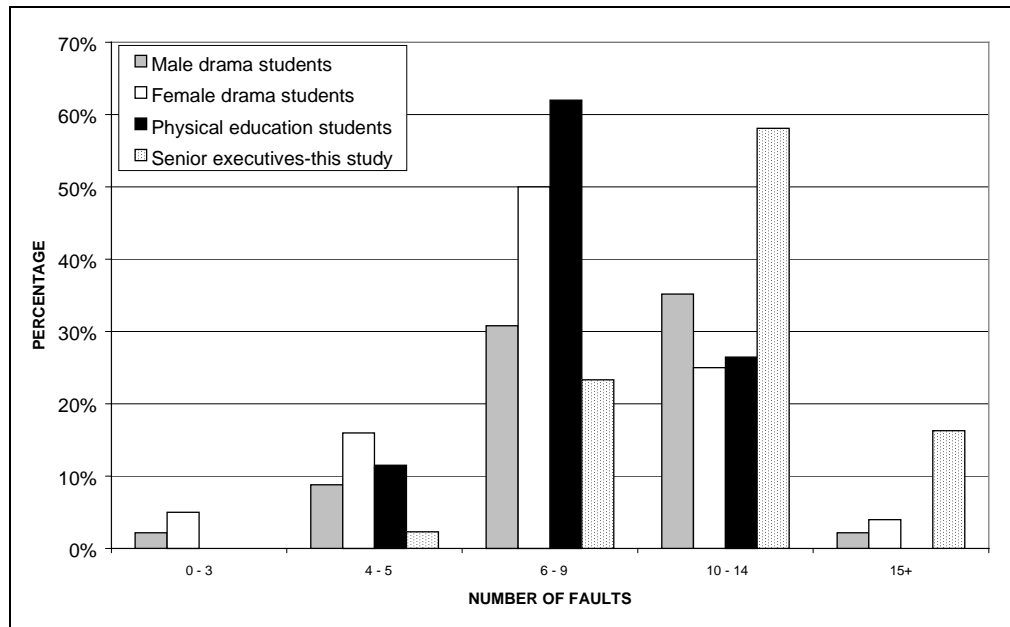


FIGURE 3. COMPARISON BETWEEN THE NUMBER OF POSTURAL FAULTS IN STUDIES BY BARLOW (1956; 1990) ON TWO GROUPS OF DRAMA STUDENTS, PHYSICAL EDUCATION STUDENTS AND THE SUBJECTS OF THE PRESENT STUDY

Postural defects in school children

The White House report of 1932 painted a bleak picture about postural defects in American school children (Kiernander, 1956). Postural defects were found in 92% of the children studied, with 44% of these having extremely severe postural defects. By the age of 11, 70% of all children will already show obvious muscular and postural defects. Usually these defects appear as passing inefficiencies and difficulties in learning, becoming accentuated in emotional situations. During adolescence the childhood faults become fully fledged defects and by the age of 18, 65% of the population will have severe defects and 15% will have very severe defects (Barlow, 1990). The subjects in this study all had postural defects with very severe postural defects (48.3%) and gross deformity (27.6%), adding up to a total percentage of 75.9 of the boys studied, indicating a higher incidence and severity of postural problems amongst school children of this study.

The postural defects found in the subjects (primary school boys) of the present study agree with those reported by others (Asher, 1975; Barlow, 1990; Dickson, 1983; Fenton, 1973; Rolf, 1977), in that kyphosis (and its associated rounded shoulders), lordosis and scoliosis are common postural problems, in addition to other postural defects also being present and noticeable. In the present study 49 of the subjects (84.5%) had abducted and "winged" scapulae, while the remaining nine (15.5%), had shoulders that were pulled together.

Kyphosis in a minor degree appears to be a common occurrence in infancy, childhood and

adolescence and “is reminiscent of the days before our ancestors assumed their upright posture” (Asher, 1975:26). Asmussen and Klausen (1962) supported this by stating that thoracic kyphosis is a feature common to all mammals. The incidence of increased kyphosis increases between the ages of 11 and 16 and diminishes thereafter (Asher, 1975). In the primary school boys of the present study kyphosis was prevalent (89.7% of all subjects, Table 5).

Kendall and McCreary (1983) identified four abnormal posture types, namely: Lordotic, kypholordotic, sway back and flat back. The first two of these are, according to Kendall and McCreary (1983), associated with an anteriorly tilted pelvis and hyperextended knees. In the present study 5.1% of the subjects were lordotic and 85% kypholordotic. Of these all had forward tilted pelvises, but only 24% had hyperextended knees. None of the subjects in the present study had flat or sway backs.

Scoliosis, however, is rarely seen under eight years of age, and not often thereafter. If a single lateral curve, usually to the left, is observed which disappears on flexion of the spine or when lying down, the condition is of postural origin (Asher, 1975). Dickson (1983), however, found scoliosis in 14.48% of a sample of 5303 school children studied. With more accurate evaluation this figure may be as high as 30% (Burwell *et al.*, 1982), which is more in agreement with the results (39.7%) of the present study. An interesting explanation for this problem by Dickson *et al.* (1984) is that idiopathic scoliosis (biplanar spinal asymmetry) is the reverse of Scheuermann’s disease.

Round shoulders was a term used by Asher (1975) to describe a whole range of postures in children namely: forward shoulders, poking head, poking neck, kyphosis and mobile scapula. She found that in most primary school children the tip of the acromion process appeared to be pointing forward, and in the older group round shoulders was a serious postural defect and which was used as a position of rest. She advocated discovering where the main fault lay and making the child appreciate the importance of recognizing the fault, as this particular posture was frequently part of the body image, and a new body image needed to be established (Asher, 1975). Body image is a term used for the visual, mental and memory images that a person has of his body. It influences the way the body is habitually used, as well as forming the background to his perceptions and it is embedded in his habitual resting state while influencing his posture, movement and communication (Barlow, 1990).

The primary school boys (subjects) in the present study all competed in some sport or other physical activity, and therefore could, to some extent, be considered to determine the effects of regular participation in physical activity/sport on posture. Postural defects of the subjects in the present study were, therefore, compared to those in the study undertaken by Barlow (1956; 1990).

In collaboration with Tanner (1978), from the Institute of Child Health, Barlow (1956; 1990) conducted studies on physical education students. This study was done at some of the leading physical education colleges in the United Kingdom. When the postural faults of the students in Barlow’s (1956; 1990) study and the subjects of the present study were compared (Figure 4), a definite pattern emerged, in that the largest percentage of subjects in both the present and the study by Barlow (1956; 1990) fell in the categories of severe and very severe postural defects. Notably and disturbing is the fact that in the group of physical education students in

the Barlow (1956; 1990) study, the majority showed severe (62.0%), or very severe (26.5%) postural defects. In the present study on primary school boys values in these categories were 20.7% and 48.3%, respectively, with gross deformities found in an appreciable number of subjects (27.6%). The values of the male senior executives in the present study were 23.3% severe, 58.1% very severe while 16.3% had gross deformity. None of the subjects in the present study had *poise*, with only a very small percentage having slight postural defects (3.4%).

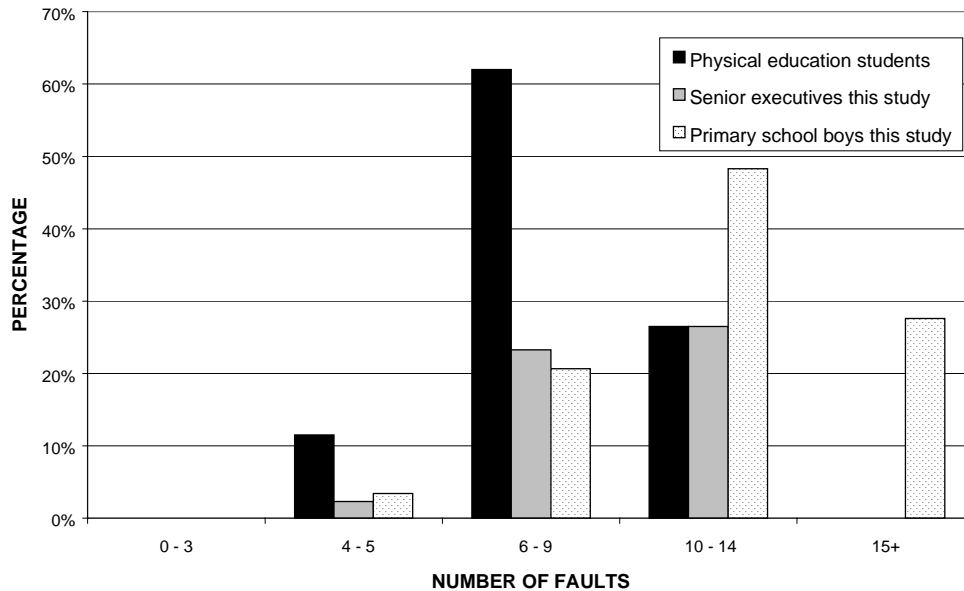


FIGURE 4. A COMPARISON BETWEEN THE POSTURAL DEFECTS IN PHYSICAL EDUCATION STUDENTS IN THE BARLOW (1956; 1990) STUDY, SENIOR EXECUTIVES AND PRIMARY SCHOOL BOYS OF THE PRESENT STUDY

In the United Kingdom high physical standards were required on entry into a tertiary training institution which drew on some of the best athletes and games players in the country. The large number of postural faults in physically active and fit individuals of this and the study by Barlow (1956; 1990) do **not** support the idea that: "... plenty of fresh air and exercise will ensure a reasonably good USE" (Barlow, 1990: 187). In this sense the word *use* is not used here in the limited sense of the use of any specific body part, as, for instance, the use of an arm or a leg, but in a much wider and comprehensive sense applying to the working of the body in general (Alexander, 1932).

CONCLUSION

The present study may serve as an indication of the extent in which posture is affected by age. The occurrence and intensity of postural defects of the primary school boys were compared with that of the male senior executives (Figure 4). Both groups in the study had poor posture,

with more boys falling in the category of gross postural defects than the male executives (Figure 4, Tables 2 & 4). This is not surprising in view of the observations made by Barlow (1956; 1990) and Woodhull *et al.* (1985), that those involved in sport and dance have poorer postures and body alignment than their sedentary counterparts. The explanation of this phenomenon is probably to be found in a point of view of Alexander made as early as 1910 (Alexander, 1996) in that one of the important outcomes of exercise should be the achievement of a balanced state. This critical important balanced state eludes us in our current highly technological driven physical and exercise culture and it seems that we cannot even achieve the most fundamental and basic starting point of all movement, namely good posture.

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