The purpose of this study was investigation the effects of classroom furniture on back, neck, lumbar and leg fatigue in students when used them, a total of 203 male students with the mean age (13.6±1.9), mean weight (48.87±14.40), and mean height (155±9.87), respectively from among 32 classes of 8 different schools of the urban community were selected randomly in this study. The results of questionnaire show a signification relationship between the tired feelings of the subjects with every dispositional condition of the classroom furniture. It was noted as well that the height of the blackboard exceeds the normal height of (178.15cm) and lies out of the comfortable sight of the users which has to be (139.5cm), (p 0.05). Results showed that tired feeling and pain of the students were mainly due to the application of non-standard furniture. The comfortable or uncomfortable feeling of the users indicating pain and local tiredness were also collected by the distributed questionnaires. The information provided in the questionnaire forms also show that 49/3% of the users were dissatisfied and felt some sorts of tiredness. The tiring condition they complained from with regard to ergonomic disposition of the furniture which were considered included 41/9% in the knee, 24.1% in the leg 51.2% in the back, 47.8% in the neck, and 24.6% from the high blackboard. The current results in addition to the incompatibility of the furniture used by the students with the anthropometrical specifications and ergonomic standards clearly showed that tired feeling and pain of the students were mainly due to the application of non-standard furniture and underlined the observance of necessary standards during the manufacture and equipment of schools.

school furniture, sitting posture, ergonomic Vastus.

Anthropometric measurements are an important factor that should be taken into account in classroom furniture design. Specific measurements, such as popliteal height, knee height, butttock–popliteal length and elbow height are necessary in order to determine school furniture dimensions that enable the correct sitting posture [1,2]. The science of human factors has rarely been incorporated into the design of school furniture children sit on chairs designed by tradition [3].

Using furniture that promotes proper posture is more important to children than adults because it is at this young age that sitting habits are formed. Bad sitting habits acquired in childhood are very difficult to change later in adolescence or adulthood [4].

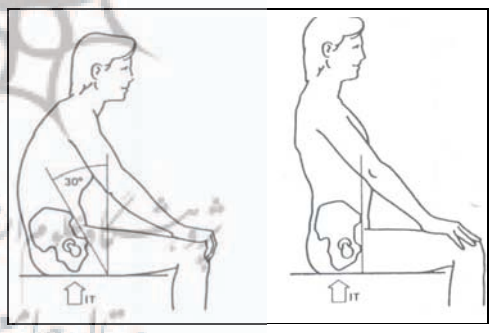
Correct standing and sitting posture is an important factor for the prevention of musculoskeletal symptoms [5]. Static posture and prolonged sitting in a forward bending position, as students often acquire, puts an extreme physiological strain on the muscles, the ligaments and in particular on the discs [6,7]. Correct standing and sitting posture is an important factor for the prevention of musculoskeletal symptoms [5].

An experimental study is reported that compares the effects on children's behavior and sitting position of traditional classroom furniture with a recently designed chair known as 'Chair 2000' and associated tables. It was found that children showed a modest but significant improvement in on-task behavior and a marked change in sitting positions following the introduction of the newly-designed furniture. However, these

benefits need to be considered in the light of polarized opinion for and against the new furniture, and a high level of reported incidence of back pain significantly related to the frequency of non-standard sitting. In the absence of radically redesigned furniture, it is suggested that children should be given more choice in their seating, and better guidance should be given to individuals involved in education in order to inform their decision-making about classroom furniture and the postural, anthropometric and orthopedics aspects of sitting and related activities [1].

Symptoms resulting from continual inconvenient sitting on non-standard furniture in the classroom had been previously reported kidney and alimentary problems [8], lumbar pains [9]. Changes in the passive flexion stiffness of the lumbar spine may increase the risk of low back injury after prolonged sitting and may contribute to low back pain in sitting [10]. The data indicate a mismatch between the students' bodily dimensions and the classroom furniture available to them. The chairs are too high and too deep and desks are also too high for the pupils. This situation has negative effects on the sitting posture of the children especially when reading and writing [11].

Shortness of hamstring muscles and increase of lordosis in the waist caused because of high benches are confirmed by the researchers [12]. Zacharkow (1988) has shown that if the height of the bench is higher than normal, the knees will bend 90 degrees and as a result the angle between the legs and torso tend to be 90 degrees therefore, more body weight will be sustained by the raised bone of the hip and part of right angle between the legs and trunk shall be provided by pressurized bending of the pelvis joint. When the angle reaches 60 degrees, such a movement would be stopped by the tension of the hamstring muscles and thus by a backward 30 degrees turning in the pelvis, efforts to complete this movement will be made (figure 1),[13].



Whiles relax position (left) pelvis turn backward and spinal column will bend. Polling the pelvis (right) need muscle force to bend forward. Hip flexion serves as a sustaining point.

By increasing the height of the desks, students feel inclined to pull their shoulders and arms forward and such as, find themselves more fatigue on the muscles of shoulder head and shrink them into an oblique and trapezoid shape.

Those sitting on the bench who are inclined to stretch their hands (arm, elbow and wrist) and shoulders forward could hasten the deformation of their body and would become hump back. To overcome this deformation, the desks and benches should have optimal height to keep the users in relaxed condition for the shoulders [14].

In addition to the optimal slope of the furniture used, consideration of a standard inclination of 10 to 15 degrees for the surface of the desk would be a sage decision. Reading or writing on the desks with zero listing could cause great problems. Usually in such cases the student holds his or her head with two arms putting the elbows on the desk, nearing the head and eyes as close to the surface of the desk as possible and shrink their body to anomalous extent. Continuing such position for longer period would cause fatigue and pain in the areas of arms, neck and shoulders [13]. Sitting with reduced ischial support and fitted backrest to the lower spine altered the contact area, reduced peak pressure under the ischia, reduced muscular activity, maintained total and segmental lumbar lordosis, rotated the sacrum forward, and increased lumbar intervertebral disc heights, which could potentially reduce low back pain [15].

In studies carried out, keeping fixed of the head in direct position for looking on blackboard with high height create some pain in lower neck area and thoracic vertebra

and this pain brings to arms and causes to some side effects such as headache, nausea, perspiration and vertigo. This position cause to increased scoliosis in cervical in long-term, so the neck muscles will short and rhomboid and trapezoid muscles will be spastic and painful [16].

The 84 to 88 percent of students time will be spend at school while they are in sitting position. There are other complementary reports which shows that 80% of student's time will be spend while their arms are on the desk or in writing position and only 32% of their time are spending on learn on the padding of the chair [13]. While ideal design of school furniture continues to be debated, efforts to make improvements have been launched. Work on higher tilted seats in Denmark has been used in the design of some school furniture [17].

It had been reported that prevalence of bad back are 33.3% in high school students and 22.8% in 6-12 ages. Therefore, it due to effect of undesirable sitting position in incidence of skeletal abnormality and physiological disorder, furniture used by students, which should make in proportional with students bodily dimensions and based on ergonomics standards. Researchers have identified a surprisingly high prevalence of back pain among schoolchildren and adolescents [18, 19]. Studies of back care education have been conducted in Europe [20], but the inclusion of this subject in schools is not universal. Many have concerns with the loads that students carry in book bags and backpacks [21,15].

The purpose of this study was investigation the effects of classroom furniture upon neck, leg, arm, back and lumbar pain and fatigue in student when used them. Evaluating the desk and bench position that was locating of school blackboard with regard to observance of ergonomic standards and also it's proportional with student's anthropometrics characteristics.

Based on Odienskey sample estimation table a total of 203 male students with the mean age (13.6±1.9), mean weight (48.87±14.40), and mean height (155±9.87), respectively from among 32 classes of 8 different schools of the urban community were selected randomly in this study. Then classes and students of each school were selected and evaluated randomly. Individual and hygienic information's also collected through close questionnaire. Evaluated materials in two sections reacted to student's anthropometrics data and furniture standards, which collected using of related tools the following:

Seat height, stature, knee height, shoulder breadth, arm length, elbow height, thorax depth, seat width and eye height (distance between eye lower corner to sitting surface) [22]. Measuring style and index points have been shown in Table1.

: Index point in measuring student's anthropometrics (Extracted by Stephen Pheasant1995).

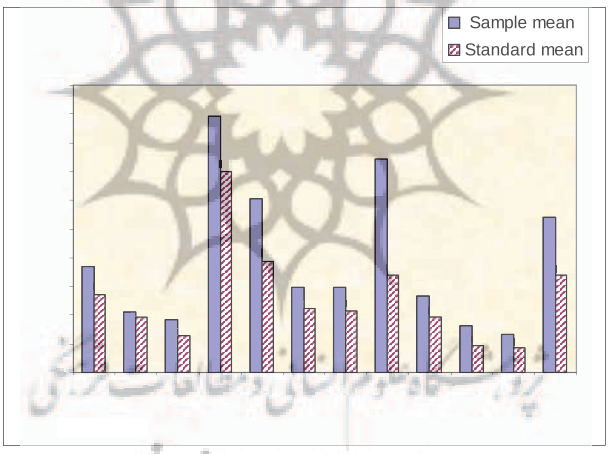
Seat surface to axis of the head	Seating height in natural position
Floor ground to knee line	Height of the back of the leg
Eye inner corner to sitting surface	Eye Height in sitting position
Horizontal distance between two sides of the buttock	Buttock width
Horizontal distance of Deltoid	Shoulder width
From the back of the buttock to back of the leg	Buttock length to groin back
From armpit to head of the bone by caliper	Thorax depth
Middle finger to head of the bone	The total Height of right foot
Middle finger to head of the bone	The total length of left arm

Bench height, desk height, desk and bench slope, seat width, backrest slope, blackboard height, distance of the first row of chairs to center of blackboard, class.

Information about students fatigue on the neck, upper and lower back, waist, thigh, leg and also general fatigue, satisfaction feeling from sitting duration and table an distance and height have been collected through questionnaire, separately. The questionnaire [10], focused on the occurrence of back pain while sitting during school hours as well as on the children's subjective perception of the school furniture.

The study data were calculated and evaluated by “scale-proportion” method and the reference anthropometrics formula as well as the t-student test (p 0.05). The questionnaire information’s evaluated by descriptive statically. Data analysis, using SPSS for MS Windows 11.5 involved the computation of descriptive statistics (Mean, Standard Deviation, Standard Error of the Mean) to describe the physical characteristics of the subjects. Anthropometric measures of each individual student were compared to the relative furniture measures in order to identify a match or mismatch between the specific student and the furniture he/she uses.

Diagram1, display comprehensive collection of the data related to those and compared with application standards.



: some dimensions for designing the desk and benches and Educational furniture. (Coefficient of Stature)

Height	1.00 Height
Eye height	0.96 Height
Body depth in standing position	0.17 Height
Stretched arm to the body sides, Length from the tip of the fingers	1.02 Height
Seat height	0.78 Height
Sitting eye height	0.70 Height
Elbow height	0.65 Height
Chair height	0.25 Height
Hip breath	0.25 Height
Buttock-knee length	0.34 Height
Seat depth	0.24 Height
From bottom to the top of the thigh	0.38 Height
Thigh diameter	0.08 Height
Distance between upper of the desk and upper of the thigh	0.60 Height
Shoulder breath	0.25 Height
Backrest height+ chair height	0.42 Height
Desire backrest height to seat surface	0.12 Height
Backrest height	0.19 Height
Sight height	0.90 Height

Table 3, Also dealings with evaluation the correction of current findings with the reference standards, (P 0.05).

The result of correlation test between research data and reference standards (P 0.05).

1	Desk height	54.25	73.6	18.4	*
2	Bench height	38.75	41.67	4.1	*
3	Bench width	37.2	25.93	-8.5	*
4	Blackboard height	136.5	178.15	5.8	*
5	Sitting height	120.9	77.15	-43.3	*
6	Knee height	58.9	44.72	-44.6	*
7	Thigh length	58.9	43.11	-39.9	*
8	Sight line	148.5	68.07	-193.6	*
9	Buttocks width	38.75	53.19	0.8	-
10	Height backrest	18.6	32.6	5.3	*
11	Thorax depth	26.35	16.8	-52.2	*
12	Sitting eye height	108.5	68.07	-97.3	*

Furniture anthropometrics measurements and ergonomics characteristics of this research are provided in table (3) and table (1) as a comparison with reference standard. Also the statistically tests results related to correlation (P 0.05), showed are in mentioned table3 and diagram1.

Based on studied carried out, wile shortness of the desk and lacking appropriate inclination, a curve may appear in shoulder and back of the person by bending them forward, which four or five upper vertebra of the back and 3rd and 4th cervical vertebra displaced forward and this displacement cause to more shoulder forward and thorax muscle causes to keep constant of shoulder forward, by it's contraction and causing neck and shoulder pain in individual in long-term [14].

Recently, the Balance chair has been introduced with claims that, because of its semi-kneeling position, individuals will experience decreased low-back pain (LBP) as well as improvement in circulation [14]. Changes in the passive flexion stiffness of the lumbar spine may increase the risk of low back injury after prolonged sitting and may contribute to low back pain in sitting [23].

Sitting may induce posterior rotation of the pelvis, reduction of lumbar lordosis, and increases in muscle tension, disc pressure, and pressure on the ischium and coccyx, which may be associated with low back pain. A device that reduces the ischial load and maintains lumbar lordosis may help increase seating comfort and reduce low back pain [15].

According to researchers, a contoured back rest, fitting the natural spinal curves, stabilizes the spine [6], facilitates lumbar lordosis [24, 25] and reduces kyphotic postures [26, 6, 27, and 28].

49.3% of students were uncomfortable of their desk; it could be state that none conforming of the desk causes to fatigue in students arm and neck. Also continuous using of such a desk cans prone students to side effects such as winging scapula, portcullis and hypnosis. Although the tallness of benches height (41.66cm) compensate high height of the desk can put weight on sacrum and tension on flexors muscles and shortened of hamstring muscles in long period of the time [12].

The sitting position, especially for long periods, was found to be the most important factor in connection to lower back pain [10, 29]. In order to improve the student's sitting position many researchers have proposed ergonomically designed [26, 6, 30, 31], adjustable school furniture [2]. Furthermore, along with the adoption of ergonomic

furniture [32], suggested the provision of educational instructions to both students and teachers about the proper adjustment of the furniture. A research shows that the students provide accurate services at the desk [33].

Findings from the questionnaire showed that 51.2 % of the students have experienced back pain and 41.9 % have experienced leg pain while working in the sitting position at school. The percentage of reported back and leg pain increases when student sitting on the own benches. The prevalence of back pain during school which was reported by Troussier et al. (1999) was also 23% and like in the present study, occurred more often at the end of the school [10].

In this research, 41.9% of students had complaint of fatigue in their legs, with regard to 34(cm), different of the height of students and the use of the desk and benches with the same height, it could be expected that feeling early fatigue and predictable in 48.3% of students. Similarly, with regard to (33cm), different of the sitting height of students and the use of average 130.5 cm installation blackboard which is compared to 178.5 cm proportional standards, 24.6% of students have been reported fatigue feeling in their neck area.

None conforming of the blackboard installation with the student's height may cause problem of forward head, mechanical there were significant differences in the shrinkage of the spine between the horizontal gaze and the 20˚ and 40˚ angles below the horizontal [34].

We don't observance of 15 to 20 degree inclination in the desk surface and also seat. Non –observance of back angle of the desk may create a torso 110 angle with the tight in users, and in addition to increasing muscular tension on shoulder and arm can create much pressure on hip flexion and lumber such a stress could make individual prone to bad back and reduce the pelvis angle and spend more energy of his body in upright position and causes more fatigue. . An adjustable angle between the seat and the backrest would appear favorable. Armrests are also recommended for certain activities. It is important that the chair can be adapted to the dimensions of the individual, and to the needs dictated by the surroundings [35].

A work station which induces a sitting position with a too-forward inclination of the head or elevated shoulders contributes to neck and shoulder pain [36]. As students of this research are using the desk and padding of the chair without inclination (Zero slop), the incidence of skeletal problem and pain or uncomfortable among them may be predictable and make anxiety .It have been reported that students find themselves fatigue and pain on their back and lumbar about 51% and in the thigh about 41.9% which could a basis for further study. Based on the evidence presented, many sixths through eighth graders must endure seating arrangements in their classrooms that are not conducive to learning [2].

It is recommended that school authorities, producers of school furniture, and relevant medical personnel consider these results for alternative designs of school furniture [25].

The relationship between current lifestyles, information and communication Technology (ICT) and physical education is another area of concern [16], In addition to physical ergonomics and fitness, cognitive and social issues related to child computer use have occupied the interest of some researchers [27]. Others question the effects upon the developing vision of children [37].These and other issues have led to a growing number of individuals around the world studying or looking for information on ergonomics related to children.

An erect sitting posture appeared to increase active shoulder flexion in subjects with shoulder impingement, although there were no differences in reported pain intensity. Further research is required to investigate the long-term effects of postural re-educating [38].

In addition to confirm of the former researchers findings [25], this result have shown that ergonomic standard used in schools furniture-making include desk and bench height, padding height, desk and bench slop and blackboard height are not proportional with the users anthropometrics dimensions. And not only can causes to early fatigue, cervical, backbone and lumbar pain and reducing in efficiency, but also may causes to incidence of postural disorder in long term such as: forward head, scoliosis, hypnosis and lordosis. Because long sitting of most students in sitting and static position at school. In this direction, in order to suitable use of mentioned furniture, right sitting and displacing their situation on behalf of the teacher, especially from physical training teachers can proceed required help to improvement of school users. Also it seems that with small change in making the desk and chair surface and back of the benches may create standard slope. Design of chairs, benches, desk and desk inclination, chair inclination if may changeable and displaceable in height by users and teachers seems possible by creating a hole and the use of thin bars and will not have any extra expenses. Select a good posture for student when use of the classroom furniture is very important for prevention of fatigue upon student body. A chair with fixed dimensions is suitable for the vast majority of the children in the same class; a desk with fixed dimensions is suitable for the majority of students in the same class.

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