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Postural Changes in Relation with Mismatched School Furniture

Nikki Indah Andraini

Abstract

Majority pupils who entered the school are in the perfect posture, however, after them graduates from elementary school, their Postural changes caused by an inappropriate postural habit during the period of stay in school. In 2018, U.S. Department of Education, National Center for Education Statistic conducted a survey and statistic number of instructional days and hours in the school year found that pupils spend 1080 hours their time at school or about 180 days/40 weeks per year. Based on literature, this article seeks to investigate mismatched school furniture impacted to deformities posture. Topics like Antropometric, Ergonomic, sitting posture and musculoskeletal disorder are investigated. The article concludes with insight important to have in mind when designing integrated school furniture.

Keyword : Musculoskeletal disorder, School Furniture, School sitting posture, Anthropometric, Ergonomic

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Postural Changes in Relation with Mismatched School Furniture

Integrated School Workstation to Support Correct Posture

Nikki Indah Andraini

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Abstract — Majority pupils who entered the school are in the perfect posture, however, after they graduate from elementary school, their Postural changes caused by an inappropriate postural habit during the period of stay in school. In 2018, U.S. Department of Education, National Center for Education Statistic conducted a survey and statistic number of instructional days and hours in the school year found that pupils spend 1080 hours their time at school or about 180 days/40 weeks per year. Based on literature, this article seeks to investigate mismatched school furniture impacted to deformities posture. Topics like Anthropometric, Ergonomic, sitting posture and musculoskeletal disorder are investigated. The article concludes with insight important to have in mind when designing integrated school furniture.

Keywords: Musculoskeletal disorder, School Furniture, School sitting posture, Anthropometric, Ergonomic

I. INTRODUCTION

Since the late 1970's, a contemporary Danish surgeon, Dr. A.C. Mandal has been actively campaign and aggressively persuaded the rest of Scandinavian countries and the European furniture standards committee that school children's health would be improved by increasing the standards of both chair and desk. He stressed that during the past 20 to 30 years, the average height of school children has increased by about four to five centimeters, but for some incomprehensible reason the height of school furniture has become lower in the same period of time. However, this mismatched school furniture standard can abuse the children's back during adolescence there from could well be the reason for the rapidly increasing number of back ailments.

Perceiving that this reports has claiming facts from decades ago, author found it as motivation to do the research of the mismatched school furniture's standard. The research itself will study about the history of school furniture and investigate the school posture. In the discussion the author will examine the workstation references in relation with pupil's reading

and writing position. However, due to Visual's guideline that allowed research literature to exact the study and investigation for ten pages maximum, author will formulate a brief overview of the literature research and conduct a clear conclusion based on author's argument.

II. METHOD

This article's findings are based on the literature review which was constructed as the secondary research. To generate the literature review report, the author required to review and analyze books, journals, reports, and websites for the data analysis.

The article will first summarize the investigated literature and discuss the relevant findings. Then, it will provide a concluded insight that might be reasonable for designing school furniture, in connection with mismatched pupil's issues.

III. DISCUSSION

History of School Furniture

When man starting entered the industrialization era in the 19th century, there were increasing demand for chairs for office and factory. In this era, the education was became flourished rapidly. Accordance with that, the awareness of study and design of proper and improper school furniture grew.

Mandal (1985) reported that in 1884, in Germany, F. Staffel constructed the school desk (Figure 1) which the style has inspired modern school furniture design.



Figure 1. The School desks in 1884
(Source from Mandal, 1984)

This was an innovation of school furniture if we trace back more than a hundred years earlier, which was in 1743, as Cranz (1998) stated that, Dr. Andry de Bois was warned against the deformities caused by improper school furniture.

“It is usual to give Children, when they are taken from the Nurse, small Elbow-Chairs, made from straw or rushes, which have all a hollow in the Bottom, because they cannot be made otherwise. Thus they place the Children upon these little Chairs, by which means their Bodies begin to

grow deformed, by little and little, in their tender Years” (Cranz, 1998)

In line with the previous statement, according to Zacharkow (1988), in 1888, Dr. Adolf Lorenz of Vienna and Dr. Felix Schenk of Bern had also considered about children’s back deformities. They were the first strongly advocate a reclined sitting posture, with the back properly supported, for writing, reading and other school activities.

After the author trace the school furniture history back then in the last decade in the 18th century, the designers and furniture makers on that time have already constructed the correct school furniture, however, it is interesting to know the reality today that there are mismatched furniture standard occurring in the past 20 until 30 years ago.

Analysis on School Posture

In 1925 and 1928, Bennett had conducted research of 4,637 pupils in Chicago elementary schools and high schools in order to examine the school posture. The study was based on the spinal form, which then was classified as either slumped or erect posture. As a result of this investigation, Bennett founded that the worst postures were in reading and writing, which was 65% slumped. Although reading and writing are categorized as activities which uses little energy expenditures, 60 cal and 70 cal per hours according to data from Human scale 4/5/6, however, these can cause adverse physical effects if it not support with proper school seating.

Zacharkow (1988) reported that in 1982, Riskind and Gotay indicated that an individual’s physical posture could have carry-over effects on motivated behavior. The individuals who were previously placed in a slumped; kyphotic (Figure 2) sitting posture, later showed significantly lower

persistence in a standard learned helplessness task, an insoluble geometric puzzle. As a conclusion, they deduced that the self perception of being in a more slumped-over physical posture predisposes a person to more speedily develop self perceptions of helplessness later, following exposure to problems that the person finds to be insoluble.

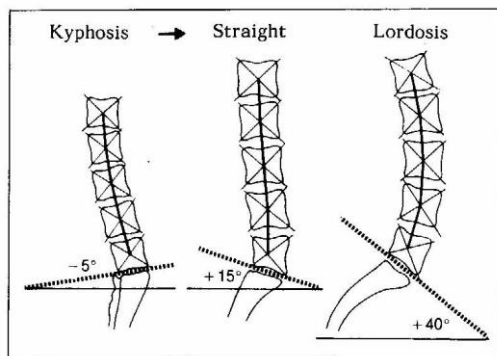


Figure 2. Spine positions
(Source from Mandal, 1984)

Riskind and Gotay's research can be the rationale for Mandal's analysis of American primary schools in 1982. Mandal observed that there were about two million new pupils came to primary school a year. He analyzed that the majority of them arrived with an almost perfect posture. But sadly, many of these children leaved school with a ruined posture after some eight or ten years later. He also stressed that the taller students were had more gradual deformation suffered and became so prominent since they retained the bends back and hunched shoulders, even when they were standing. Mierau (1984) reported the prevalence of low back pain was 22.8 percent among an elementary school population (student ages 6 to 12 years) and was found to increase to 33.3 percent among a secondary school population (students ages 12 to 17 years).

Based on the investigations above, it shown that either the schools or the pupils were not recognizes that the deleterious effects of improper

school furniture on the spine were occurring in the school ages. It is regrettably if this situation is happening continuously without any campaigns or prevention efforts.

Until now, concepts of 'correct' school furniture design appear to have been based more on ethics, aesthetics, disciplines and wishful thinking than on science. Most of The school authorities seem to place high priority on low cost furniture that is easily stacked and compactly stored. However, the Author will not discussed more on this issue, as it needs to conduct further field's research.

By analyzing the school posture, it found four major things to be focused if the designers want to design correct school furniture. It strains into desk height, desk slope, reading and writing posture.

Determining a proper desk height is very significant since it can affect on how children study in classroom. The high desk height will affect children to increase the stress on the deeper posterior neck musculature when they are providing stabilization of the head posture (Picture 3)

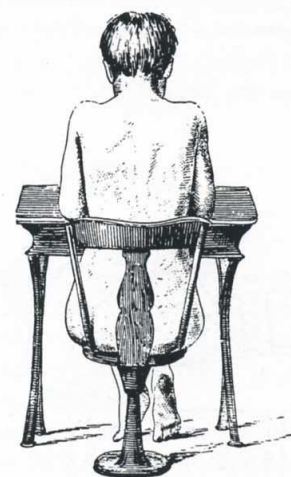


Figure 3. High desk heights
(Source from Zacharkow, 1988)

Whereas the too low desk will force the student to bend his head down to get the proper reading distance.



Figure 4. Low desk heights
(Source from Zacharkow, 1988)

In order to get precisely the desk height of each student, Mandal (1981) recommended that the table should at least half of the student's height.

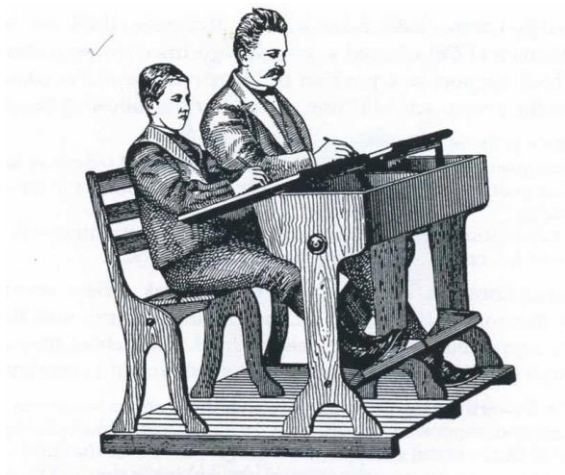


Figure 5. The correct writing position
(Source from Zacharkow, 1988)

The advantage of a sloped desk is that the upper and lower lines of the paper will be about equally distant from the eyes. A sloped desk will also result in better window illumination. Zarchakow (1988) stated that among earlier school seating authorities, Shaw (1902) recommended a desk inclination of 15 degrees for writing, Porter (1906) recommended 15 to 20

degrees, Gould (1905) recommended an inclination of at least 30 degrees, and Dresslar (1917) recommended a desk inclination of at least 45 degrees. More recently, Mandal (1981) renewed interest in desk slopes greater than currently used, advocating a 30 degrees inclination for writing.

For both reading and writing, the most advantageous arm posture would then involve having the upper arm in a vertical position with the elbow close to the side of the body. The forearm should be elevated from the horizontal, coinciding with the plane of the desktop inclination (Figure 6) (Zacharkow, 1988).

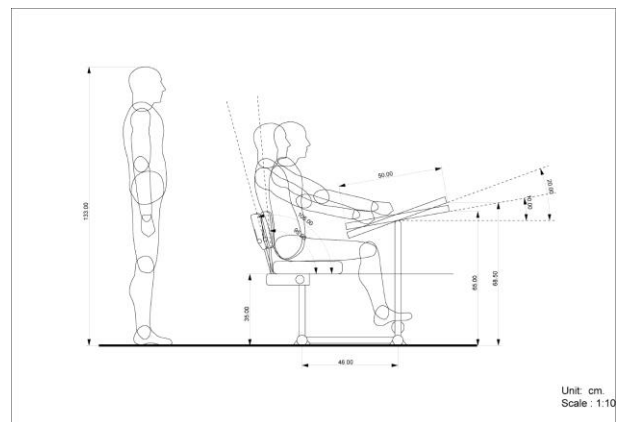


Figure 6. The integrated table and chair school workstation - Initial project development
(Source from Andraini, 2007)

IV. CONCLUSION

As have been seen, there are many factors involved in correct school furniture standards and a total approach incorporating all factors is required, nevertheless, until today not every pupil from different countries fortunate to have the same opportunity of the proper workstation as in Scandinavian countries. Thanks to A.C. Mandal who was constantly persuaded Danish and Swedish major school furniture manufacture to revise their standard in an attempt to decrease back ailments caused by mismatched furniture. However, if this breakthrough can be applied

world-widely, the back ailment could gradually shrink and pupil's learning activities at classroom could be optimum.

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