

Intelligent Height and Reach Adjustable Electronic Chair for Children with Dwarfism (ZUMP)

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WHAT IS DWARFISM?

“Dwarfism”, “little people”, “short statue” or even “midget” are some of the general names given by society to these special communities. According to the definition of the advocacy group for Little People of America (LPA), Dwarfism is a condition characterized by short stature. Technically, an adult with the height of 4 feet 10 inches or under.

Based on the study on the dwarfism symptom, it can be caused by any one of more than 200 conditions, most of which are genetic. Most types of dwarfism are known as skeletal dysplasias, which are conditions of abnormal bone growth. In fact, 85% of children with skeletal dysplasias do occur in families where both parents are of average height. Being a dwarfism is not an intellectual disability. A person who has dwarfism is typically of normal intelligence. Somehow, dwarfism is a disease that requires a “cure”. Most people with the condition can live long and fulfilling lives. Lastly, it will not be good reason to assume dwarfism is incapable. Little people go to school, go to work, marry, and raise children, just like their average-size peers.

As the child with dwarfism grows, other issues may also become apparent, including,

- delayed development of some motor skills, such as sitting up and walking
- a greater susceptibility to ear infections and hearing loss
- breathing problems caused by small chests
- weight problems
- curvature of the spine (scoliosis)
- bowed legs
- trouble with joint flexibility and early arthritis
- lower back pain or leg numbness
- crowding of teeth in the jaw

Although the types of dwarfism, severity and complications vary from person to person, in general a child's life span is not affected by the dwarfism.

In Malaysia, **Association of and for the Little People in Malaysia** (*Little People Welfare organization of Malaysia*) is the party that gathers and encourages little people in Malaysia. **Figure 1** shows some of the members from this organization during a trip to visit some other dwarfism child in Malaysia.



Figure 1: Members from Little People Welfare organization of Malaysia

ZULL HANIF AND SCHOOL

Zull Hanif Bin Abd. Halim comes from a family of 5 members, which includes father, mother, one elder sister and one younger sister. Both parents and his elder sister are healthy and have normal body sizes. Due to skeletal

dyplasias, Zull Hanif and his younger sister are born with dwarfism symptoms. At the age of 7, his body height was only 30 inches or equivalent to 2 feet and 6 inches.

In early January 2007, Zull Hanif Bin Abd Halim started his primary school life at Sekolah Kebangsaan Sinar Mutiara, Sungai Miang, Pekan Pahang. Due to his abnormal body height, normal table and chair were not suitable for his usage. This incident forced the school teacher to cut the table and chair's leg so that it suited his height. He has to sit alone in front of all students and has difficulty to focus on the learning process. Eventually, he felt depressed and afraid of school life. This case indicates that there is no specific equipment from our community to help those dwarfism children in schooling life.

Since Utusan Malaysia reported Zull Hanif schooling life on 4th January 2007, UMP vice chancellor Professor Datuk Dr. Mohammad Said Mat Lela had come out with an idea to initiate an aid for those dwarfism children, specifically to Zull Hanif. At once, a special research team from Faculty of Mechanical Engineering (FKM), UMP lead by Assoc. Prof. Rosli Abu Bakar was formed. Some brain storming and conceptual ideas were created as a basic guide to assist dwarfism child in classroom learning process.

CONCEPTUAL DESIGN OF ZUMP

From the brain storming session, three concept design based on different operating mechanism were created as shown in **Figure 2**.

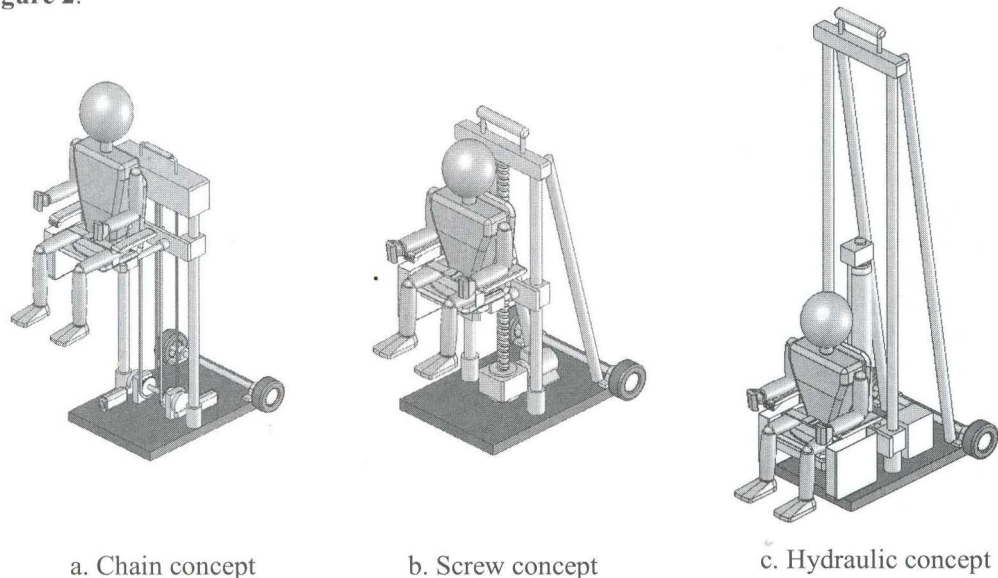


Figure 2: Various conceptual design for ZUMP

Among these three designs, detail comparison was made to identify the advantages and disadvantages of these concepts. From the evaluation process, the results were listed in **Table 1**.

Table 1: Comparison between various concept designs

Concept	Advantages	Disadvantages
a. Chain design	<ul style="list-style-type: none"> - simple construction - standard parts and reduce cost 	<ul style="list-style-type: none"> - limited carry load - noise - no safety for any failure
b. Screw design	<ul style="list-style-type: none"> - precise control in height and reach distance - Contacting parts was covered 	<ul style="list-style-type: none"> - higher development cost
c. Hydraulic design	<ul style="list-style-type: none"> - higher carry load - less components - simple construction 	<ul style="list-style-type: none"> - too high in construction cost - oil leakage problem - weight issues - stability problem